DARTMOUTH COLLEGE LIBRARY
JUL 22 1985
PERIODICALS DEPARTMENT

DÆDALUS

JOURNAL OF THE AMERICAN ACADEMY OF ARTS AND SCIENCES

Weapons in Space

Vol. II: Implications for Security

Christoph Bertram
Hans A. Bethe
Jeffrey Boutwell
Abram Chayes
Antonia Handler Chayes
Marie-France Garaud
Richard L. Garwin
David Holloway
F. A. Long
T. B. Millar
George Rathjens
Jack Ruina
Eliot Spitzer
John C. Toomay
John Wilkinson

SUMMER 1985 $5.00

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

BOARD OF EDITORS:

David Apter, Daniel Bell, Isaiah Berlin, François Bourricaud, Herman Feshbach, Paul Freund, Clifford Geertz, Gerald Holton, Charles P. Kindleberger, Hans H. Landsberg, Martin Meyerson, Steven Muller, Carl E. Schorske, Judith N. Shklar, Jean Starobinski, Lewis Thomas, Robert Wilson

STEPHEN R. GRAUBARD
Editor of the Academy and of Dædalus

ELIZABETH LILLA
Manuscript Editor

CAROLYN W. ERSKINE
Editorial Assistant

MARTHA H. NELSON
Editorial Assistant

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

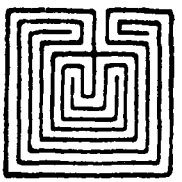
DÆDALUS

JOURNAL OF THE AMERICAN ACADEMY OF ARTS AND SCIENCES

Weapons in Space, vol. II: Implications for Security

Summer 1985

Issued as VOLUME 114, NUMBER 3, of the Proceedings
of the American Academy of Arts and Sciences



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Summer 1985: Weapons in Space, vol. II. Issued as Volume 114, Number 3, of the Proceedings of the American Academy of Arts and Sciences

Copyright © 1985 by the American Academy of Arts and Sciences

Library of Congress Catalog Card Number 12-30299

Editorial Offices: Dædalus, *Norton's Woods, 136 Irving Street, Cambridge, Massachusetts 02138*

Dædalus (ISSN 0011-5266) *is published quarterly by the American Academy of Arts and Sciences. Subscription rate: $16, one year; $32.00, three years.*

All subscriptions and single copy orders and change of address information must be sent in writing *to the* Dædalus *Business Office, P.O. Box 515, Canton, Massachusetts 02021, U.S.A. (Tel) 617-828-8450. Orders for single copies must be accompanied with prepayment of $5.00.*

Printed in the United States of America
Printing Office: 2901 Byrdhill Road, Richmond, Virginia

Second-class postage paid at Canton, Massachusetts, and at additional mailing offices.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Contents, vol. II

v Preface

ix Glossary of Acronyms

Abram Chayes, Antonia Handler Chayes, Eliot Spitzer
193 Space Weapons: The Legal Context

John C. Toomay
219 The Case for Ballistic Missile Defense

George Rathjens and Jack Ruina
239 BMD and Strategic Instability

David Holloway
257 The Strategic Defense Initiative and the Soviet Union

Christoph Bertram
279 Strategic Defense and the Western Alliance

Foreign Perspectives on the SDI
297 John Wilkinson, p. 297; T. B. Millar, p. 303; Marie-France Garaud, p. 308

Jeffrey Boutwell and F. A. Long
315 The SDI and U.S. Security

Appendix A: New BMD Technologies
331 Hans A. Bethe and Richard L. Garwin

Appendix B: Relevant Documents
369 President Reagan's Address to the Nation, p. 369; Report of Defense Secretary Weinberger, p. 373; 1972 ABM Treaty, p. 379

395 Notes on Contributors

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ADVISORY GROUP

Ruth Adams, Jeffrey Boutwell, Harvey Brooks, Ashton B. Carter, Abram Chayes, Herman Feshbach, Alexander Flax, Richard L. Garwin, Donald L. Hafner, Spurgeon Keeny, F.A. Long, Judith Reppy, Jack Ruina, Walter Slocombe, Jasper Welch, Jr., Charles A. Zraket

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Preface to the Issue, "Weapons in Space," vol. II

THIS IS THE SECOND of two volumes that *Daedalus* is devoting to weapons in space, more specifically to the Strategic Defense Initiative that President Reagan announced on March 23, 1983. I would refer those who are curious about the rationale for the study to the preface of the first volume, which also provides an account of why these volumes need to be read in the context of a *Daedalus* interest in arms control and defense policy that extends over a quarter of a century.

The classic *Daedalus* volume on the subject was produced in 1960. Twenty years later, in the first of two issues on "U.S. Defense Policy in the 1980s," I tried to recapture the mood of the early 1960s. Remarking on the fact that many who wrote in the pioneer study accepted that arms control and weapons studies were not exclusively technological or scientific, I went on to say:

> They argued, and developed theories to support their views, that new modes of negotiation between the great powers were essential. They created new theories about how the nuclear powers needed to comport themselves in respect to each other, what kinds of information each might find it desirable and useful to share and pass on to the other, why the old putative military advantages—surprise and secrecy—were fundamentally unsuited to diplomacy and international politics in the thermonuclear age. The authors in the 1960 issue of *Daedalus* did not go so far as to recommend the traditional religious injunction "to love thine enemy," but they insisted on close and constant communication with the Soviet Union, believing cooperation (on many levels) to be the keystone to peace. The United States, in effect, was encouraged to become tutor to the Soviet Union; American security, it was argued, would be enhanced if the Soviets became more proficient and knowledgeable in nuclear matters. The alternative, they believed, could be atomic disaster.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

I then added:

This is not to suggest that those who argued in this way were wholly trusting of the Soviet Union; few believed such trust to be either desirable or necessary. In thinking about ways to control what each of the atomic powers developed militarily, the new "arms controllers" showed their faith in the possibility of inventing highly sophisticated technological and other procedures that would guarantee effective weapons inspection, that would detect and advertise violations of the arms control procedures agreed upon. Cheating would be well-nigh impossible. The development of such complex methods of detection and surveillance became a high-priority objective. If the Soviet Union came to know more about American military capabilities and intentions, and if Americans enjoyed the same knowledge about the Soviet Union, both would be deterred; the chances of peace would be vastly increased. Such was the belief of many who thought about these questions in 1960.

Whatever merit such opinions may once have had, they do not enjoy the same easy acceptance now. While some may even today believe that they offer the most reasonable guarantee for peace between the great powers, many, including the president of the United States, are not persuaded that the United States (and its allies) must for all time remain permanently vulnerable, relying on a land- and sea-based deterrent to keep the Soviets from launching an attack, which would be overwhelmingly resisted, with vast destruction for all. The president has imagined defenses that would make such an attack unthinkable. The Strategic Defense Initiative is offered as an engineering feat capable of providing absolute security against most forms of missile attack.

Those who see the matter otherwise, who believe that it is impossible for one side or the other to win a decisive defense advantage without totally destabilizing the fragile balance that now exists, insist that the original perception was right, that those who now argue for an impregnable defense system to restore the absolute security once enjoyed are simply mistaken. Such policies, they say, would only provoke an even more dangerous arms race, destroying what little hope for arms-control negotiation now exists. Those who support the president argue the contrary, insisting that wholly new prospects for peace are opened up by the space experiments now contemplated.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

In the view of those who have helped prepare these volumes, this is indeed a major turning point in world history, with implications for the security of the United States and the peace of the world, not to mention American and Soviet politics and economic development that transcends much of what is being argued over in other places. While it is unlikely that consensus will soon be reached on many of the issues discussed in these volumes, it is essential that a new generation, aware of the gravity of the proposals now being contemplated, participate in the debate now being initiated.

Thanks are due to the Carnegie Corporation for making funds available to the American Academy of Arts and Sciences that has permitted us to publish these volumes. A special debt is owed to Professor Franklin Long for initiating this project, to Drs. Jeffrey Boutwell and Donald Hafner for their continuing assistance in working with the authors and in making their own contributions to our discussion.

S.R.G.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

GLOSSARY OF ACRONYMS

ABM	anti-ballistic missile
ACDA	Arms Control and Disarmament Agency
ALCM	air-launched cruise missile
AOA	airborne optical adjunct
ASAT	anti-satellite
ASW	anti-submarine warfare
ATBM	anti-tactical ballistic missile
ATP	Acquisition Tracking and Pointing [system]
AWACS	airborne warning and control system
BAMBI	ballistic missile boost intercept [system]
BMD	ballistic missile defense
BPI	boost-phase intercept
BSTS	Boost Surveillance and Tracking System
C^3I	command, control, communications, and intelligence
DARPA	Defense Advanced Research Projects Agency
DEW	directed energy weapon
DOD	Department of Defense
DOE	Department of Energy
DSAT	defensive satellite
DTST	Defensive Technologies Study Team [Fletcher panel]
ELINT	electronic intelligence
EMP	electromagnetic pulse
FOBS	fractional orbital bombardment system
FOFA	follow-on-force attack
GLCM	ground-launched cruise missile
GEO	geosynchronous orbit
GPS	Global Positioning System [Navstar]
HADS	high-altitude defense system
HF	hydrogen fluoride
HKV	homing kill vehicle
HOE	Homing Overlay Experiment
HSD	hard site defense
ICBM	intercontinental ballistic missile

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

INF	intermediate-range nuclear forces
IR	infrared
LEO	low earth orbit
MAD	mutual assured destruction
MaRV	maneuvering reentry vehicle
MIRV	multiple independently targetable reentry vehicle
MSR	missile site radar
NCA	National Command Authority
NTM	national technical means [of verification]
PAR	perimeter acquisition radar
R&D	research and development
RDT&E	research, development, testing, and engineering
RORSAT	radar ocean reconnaissance satellite
RV	reentry vehicle
SALT	Strategic Arms Limitation Talks
SAM	surface-to-air missile
SATKA	surveillance, acquisition, tracking, kill assessment
SCC	Standing Consultative Commission
SDI	Strategic Defense Initiative
SDS	satellite data system
SLBM	submarine-launched ballistic missile
SLCM	sea-launched cruise missile
SSTS	Space Surveillance and Tracking System
START	Strategic Arms Reduction Talks
TNF	tactical nuclear forces
UV	ultraviolet

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Abram Chayes, Antonia Handler Chayes, Eliot Spitzer

Space Weapons: The Legal Context

SINCE THE BEGINNING OF THE SPACE AGE, political leaders and international lawyers have worked to establish a legal regime to govern activities in outer space. In the following three decades, a considerable, if by no means comprehensive, body of law has evolved. Elaborate conventions now regulate the placement of satellites in geostationary orbit, the allocation of frequencies for space communications, liability for space accidents, weather reporting networks, and many other specific activities in outer space.

This paper examines the bearing of this body of law on the use of outer space for ballistic missile defense and anti-satellite weapons. It begins with a brief examination of the general orientation of the Outer Space Treaty concerning military activities in space.[1] For the most part, this takes the form of general principles and guidelines, significant more for the broad attitudes and approach they express than for the setting down of positive legal rules. Detailed regulation of space-based ballistic missile defense systems is to be found not in those documents dealing with outer space generally, but, as is so often the case, in functionally specific agreements—agreements directed expressly at arms control, the provisions of which cover outer space as well as other environments. The most important of these is the Treaty on the Limitation of Anti-Ballistic Missile Systems (ABM treaty), which the United States and the Soviet Union signed and ratified in 1972.[2]

Today, more than a dozen years later, the ABM treaty remains the only permanent and legally operative bilateral arms-control agree-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ment fully in effect between the two superpowers—a thin legacy of detente and its hope of attaining substantial reductions of strategic arms. This single document bears an extraordinarily heavy burden in U.S.-Soviet security relations. McGeorge Bundy, George Kennan, Robert McNamara, and Gerard Smith have argued that "the ABM treaty stands at the very center of the effort to limit the strategic arms race by international agreements."[3] It is a delicate only child. If it fails, the future of any negotiated treaty regime of arms control will be thrown into question. The implementation and effectiveness of the ABM treaty therefore merit special scrutiny.

The fundamental strategic assumption underlying the treaty is that the security of the United States is best guaranteed by a relationship of mutual deterrence between itself and the Soviet Union, and that the stability of this relationship would be threatened by the deployment of defensive systems that might call into question either side's retaliatory capability. To this end, the basic provisions of the treaty sharply curtail for the indefinite future the development of such defensive systems, permitting only token deployment at a single site.

Those who drafted the treaty knew that technology would not stand still: its provisions therefore apply not only to system concepts that were current in the early 1970s, but to unforeseen "systems based on other physical principles" as well. But no treaty can anticipate every eventuality, and the ABM treaty, like any other legal instrument, is subject to varying interpretations, especially as technological change has altered the factual context. Unlike domestic legal systems, however, there is no impartial tribunal to give an authoritative or binding interpretation when disputes arise; the achievement of the treaty objective depends on the continued commitment of the two parties.

New developments have raised questions about the strength of that commitment on both sides. The president of the United States has announced an objective that is in fundamental opposition to the treaty goals: the creation of a defensive shield over the United States. He has established a powerful bureaucratic organization disposing of large resources to accomplish the strategic objective. Members of the Reagan administration, including the president himself, were opposed to the ABM treaty in 1972; the secretary of defense has, more recently, publicly questioned its utility. The Soviets are conducting their own extensive BMD research programs, though without the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

same public scrutiny that exists in the United States as a result of the presidential initiative and congressional review. In addition, there is a strong conviction among U.S. government officials and large segments of the population that the Soviets are in fact violating the treaty, thus demonstrating the absence of any commitment to it.[4]

Moreover, deterioration in the political relationship between the two countries is taking its toll on this fragile treaty regime. Since behavior under the treaty can only be regulated by discussion between the parties themselves, a relationship marked by incivility and petulance, accusations and counter-charges, makes it next to impossible to resolve questions that inevitably arise concerning ambiguous activity, apparent violations, or differences in interpretation.

The altered technological and political setting since 1972 has thus brought the ABM treaty under heavy pressure. As we have noted, President Reagan has challenged the fundamental strategic assumption on which the treaty was based: that anti-missile systems erode rather than enhance national security. He has backed this challenge with a $26 billion five-year research program, conceived as the first step in an effort to build and deploy a strategic defensive system. This raises the question of what will happen to the treaty in the interim. Can the treaty survive the SDI program and similar Soviet efforts? What sorts of political and legal pressures can the ABM treaty withstand?

THE OUTER SPACE TREATY

The first efforts in the field of space law reflected a spirit of international cooperation and a determination to depart sharply from previous treatment of new territories or common environments in international law. This cooperative spirit pervades the Outer Space Treaty, which was developed in the United Nations in 1967 to establish a general framework for activities in outer space, and now has approximately eighty signatories. The preamble of the Outer Space Treaty and the General Assembly resolutions leading up to it proclaim the lofty principle of "peaceful use." Unlike the continents newly discovered by Europeans from the 16th to 19th centuries, "outer space, including the moon and other celestial bodies, is not subject to national appropriation."[5] And unlike the high seas, which

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

since Salamis and Actium have been the arena of decisive military engagements, the exploration and use of space is to be "for peaceful purposes."[6]

The specific rules embodied in this treaty, however, are rather more guarded in their restraints on national military activities. Article IV, the key provision, states that "The moon and other celestial bodies shall be used . . . exclusively for peaceful purposes." As for outer space generally, the only provision restricting activities forbids the placing "in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction . . . or station[ing] such weapons in outer space in any other manner."[7] The "peaceful purposes" rubric applied to the moon and other celestial bodies is never defined in the treaty, but presumably comprehends more than the simple prohibition applied to outer space generally.

The reason for the different treatment of "celestial bodies" and "outer space" generally was to accomodate nuclear ballistic missiles, which were just entering the arsenals of the U.S. and the Soviet Union as the treaty was being negotiated. A major portion of the trajectory of such missiles is in outer space, but they do not go into orbit. The language of Article IV was carefully chosen to ensure that the general principle of "peaceful uses" would not interfere with the testing of these weapons.[8]

The treaty also remains silent on the use of military satellites for reconnaissance, surveillance, early warning, and communications. The United States has always taken the position that such "passive" military uses are compatible with a doctrine of peaceful purposes. The Soviets, at first, seemed to take the contrary view. An early Soviet draft of the proposed treaty, drawn up at a time when the United States had a monopoly on observation satellites, contained a provision expressly forbidding their use. The United States and its allies opposed this provision. They argued that international law did not forbid observation of a state from points outside its national territory, and that there was no sound justification for making an exception in the case of outer space. The Soviet Union eventually conceded on this point, but perhaps the change of position had as much to do with its acquisition of the relevant technology as with the force of the U.S. legal argument.

In any case, it is clear from this history that reconnaissance and other "passive" military satellites are not prohibited by the Outer

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Space Treaty. This conclusion has since been confirmed by the provisions of the ABM treaty and other arms-control agreements in which the United States and the Soviet Union endorse the use of "national technical means of verification" to assure compliance, and agree not to interfere with them.

Although only a few provisions of the Outer Space Treaty deal specifically with military activities, and those that do leave much ground uncovered, the affirmation of the basic principles of peaceful purposes and international cooperation in exploration and use nevertheless remains important for the construction and application of more specific agreements governing outer space activities. The principles reflected widespread attitudes toward the new environment of space in the late 1960s, when the treaty was adopted, and there is little reason to suppose that those attitudes are different today. The principles of the treaty have remained largely intact throughout the past thirty years of outer space activity. During this time, there has been general agreement between the superpowers that the principle of peaceful use could accommodate passive military uses. And though both Soviet and U.S. military forces have increased the use of space for these purposes, and have even conducted research and development on programs that would go beyond those limits, the actual pursuit of military activities in outer space has so far all been of the passive variety. Ballistic missile defense (BMD) and anti-satellite (ASAT) systems could well represent the first significant challenge to the continued viability of the first and only international legal framework that has governed outer space.

THE ABM TREATY

The Treaty on the Limitation of Anti-Ballistic Missile Systems, which took effect in 1972, is the only bilateral agreement in full force between the United States and the Soviet Union limiting the armaments of the two countries. It is the linchpin of a thirty-year effort to limit the strategic weapons of the superpowers.

The chief purpose and effect of the treaty is to eliminate defensive—that is, anti-ballistic missile—systems from the arsenals of the two countries (with the exception of a single designated site on each side, sharply limited in area and armament). To that end, the first obligation undertaken by each government, as set forth in Article I of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the Treaty, is: "not to deploy ABM systems for the defense of the territory of its country. . . ."

It is clear that the task President Reagan has set before the American scientific community—to devise systems that will "interrupt and destroy strategic ballistic missiles before they reach our own soil"—is a task that, if accomplished, would flatly violate the solemn treaty obligations of the United States. (The express ban on deployment of ABM systems for defense of the territory of its country means that any ABM system designed to intercept missiles in the boost phase is necessarily barred by the treaty, because in that phase the targets of the incoming missiles cannot be determined.)

The plain meaning of Article I is fully corroborated by an analysis of the treaty's more detailed provisions. For example, under Article V, each country undertakes the comprehensive obligation "not to develop, test, or deploy any ABM systems or components that are sea-based, air-based, space-based, or mobile land-based." This sweeping prohibition is not limited to deployment, but expressly extends to development and testing as well; it applies not only to entire systems, but with equal force to components. The only exception to the prohibition is fixed land-based systems, and here what is permitted is highly circumscribed. Deployment is confined to a single limited site 150 kilometers in radius and with no more than one hundred launchers, as specified in Article III. Since, according to Article VII, it is permissible to modernize existing fixed land-based systems, development and testing of such systems are also allowed by the treaty. Such activities, however, can only occur on "current or additionally agreed test ranges." In the U.S., testing and development are confined to two test sites, located at White Sands, New Mexico, and at Kwajalein Atoll in the Pacific, the two sites identified by the U.S. delegation as already existing at the time the treaty was concluded. Similarly, the Soviet Union is limited to test ranges at Sary Shagan and Kamchatka. These are categorical limitations imposed by the agreement.

It has occasionally been suggested that the treaty does not apply to ABM systems based on exotic technologies such as lasers or particle beams, both of which are part of the Strategic Defense Initiative (an argument that has not, it should be said, been made by the administration). The suggestion seems to rest on the definition of ABM systems contained in Article II of the treaty:

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

An ABM system is a system to counter strategic ballistic missiles, or their elements in flight trajectory, currently consisting of:

(a) ABM interceptor missiles, which are interceptor missiles constructed and deployed for an ABM role, or of a type tested in an ABM mode;

(b) ABM launchers, which are launchers constructed and deployed for launching ABM interceptor missiles; and

(c) ABM radars, which are radars constructed and deployed for an ABM role, or of a type tested in an ABM mode.

It is contended that exotic technologies do not use interceptor missiles or launchers or radars, and thus do not fall into the categories of ABM systems banned by the treaty. The argument proceeds with reference to Agreed Statement D:

In order to insure fulfillment of the obligation not to deploy ABM systems and their components except as permitted in Article III of the Treaty, the Parties agree that in the event ABM systems based on other physical principles and including components capable of substituting for ABM interceptor missiles, ABM launchers, or ABM radars are created in the future, specific limitations on such systems and their components would be subject to discussion in accordance with Article XIII [establishing a Standing Consultative Commission] and agreement in accordance with Article XIV [providing for possible amendment] of the Treaty.

From this it is argued that the only limitation on exotic systems is a requirement of consultation with the other party to the treaty.

This argument is specious. Article II cannot be read so narrowly. Mindful of potential advances in technology, the drafters defined ABM systems in the most general and comprehensive terms: "systems designed to counter strategic ballistic missiles or their elements in flight trajectory." The use of the word "currently" is a recognition that ABM systems might not always consist of the components enumerated, and indeed were not expected to. As Dr. Raymond Garthoff, a member of the U.S. negotiating team, stated: "The word 'currently' was deliberately inserted into a previously adopted text of Article II . . . in order to have the very effect of closing a loophole to the ban [on future ABM systems]."[9]

Nor does Agreed Statement D open the door for systems based on exotic principles. On the contrary, the language "to insure fulfillment of the obligation not to deploy ABM systems and their components

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

except as provided in Article III" makes it clear that the Statement applies only to those deployments permitted by Article III, that is, fixed land-based systems at a single designated site. Replacement of these by "systems based on other physical principles" is permitted, according to the Statement, only by amendment of the treaty after consultation between the parties. Nor does the Statement modify the prohibition in Article V against development, testing, or deployment of systems or components "which are sea-based, air-based, space-based, or mobile land-based."[10]

This straightforward meaning of the language of the Treaty is fully supported by the legislative history—including the analysis and explanation in the president's submission of the treaty to the Senate,[11] and the testimony in the Senate hearings preceding ratification. These are part and parcel of the ratification process and represent the understanding of the treaty obligations accepted by the president and by Congress. They confirm the interpretation that the treaty is broad in its prohibitions (not only against deployment, but extending to development and testing) and narrow and explicit in its exceptions for permitted activity. This view has been reinforced by executive and congressional commentary since ratification. Secretary of State Rogers during the preratification hearings before the Senate Committee on Foreign Relations confirmed that the treaty would extend even to exotic defense systems.

> The treaty provides for other important qualitative limitations. The parties will undertake not to develop, test or deploy ABM systems or components which are sea-based, air-based, space-based or mobile land-based. . . . Perhaps of even greater importance as a qualitative limitation is that the parties have agreed that future exotic types of ABM systems, i.e., systems depending on such devices as lasers, may not be deployed, even in permitted areas.[12]

The absolute prohibition on any development, testing, or deployment of space-based ABM systems—including those dependent on exotic technology—was also explicitly recognized by Secretary of Defense Laird[13] and Ambassador Gerard C. Smith, chief U.S. negotiator of the treaty and head of the Arms Control and Disarmament Agency (ACDA) at the time the treaty was concluded.[14]

The report of the Senate Committee on Foreign Relations, recommending that the Senate approve the treaty quoted from those

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

passages of Secretary of State Rogers's testimony stressing the absolute nature of the ban on space development, testing, and deployment.[15] In the floor debate on the treaty, the absolute ban on space activities was accepted without question, as was the ban on deployment of "exotic" ABM systems, even at permissible fixed land-based ABM sites.[16]

The Arms Control Impact Statements, prepared annually by ACDA have uniformly adopted this same interpretation. The statement of fiscal year 1984—the most recent available—represents the official position of the present administration. It says:

> The ABM Treaty bans the development, testing, and deployment of all ABM systems and components that are sea-based, air-based, space-based, or mobile land-based. In addition, although the Treaty allows the development and testing of fixed, land-based ABM systems and components based on other physical principles (such as lasers or particle beams) . . . the Treaty prohibits the deployment of such fixed, land-based systems and components unless the Parties consult and amend the Treaty.
>
> The ABM Treaty prohibition on development, testing and deployment of space-based ABM systems, or components for such systems, applies to directed energy technology (or any other technology) used for this purpose. Thus, when such DE [directed energy] programs enter the field testing phase they become constrained by these ABM Treaty obligations.[17]

Recent congressional testimony by former government officials further demonstrates the uniform acceptance of this view.[18]

ISSUES OF TREATY INTERPRETATION

The legal defense of the Strategic Defense Initiative, however, has not relied on the general claim that its programs and activities are outside the purview of the ABM treaty. For the present, it rests primarily on the claim that these are *research* activities, and that the treaty places no strictures on "research," as it does on "development" and "testing." For the future, even the proponents and managers of the SDI recognize that the program, amounting to $26 billion in the first five years, must ultimately come up against the treaty limits. Yet the likelihood of being able to negotiate satisfactory amendments or create a substitute treaty has not been seriously addressed in any public forum. Instead, the administration is relying on ambiguities in

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the treaty language to provide a legal rationale for program developments as they arise. Three areas of ambiguity, in particular, lend themselves to such use:

(1) What is the line between *research,* which is not prohibited by the treaty, and *development* which, except for fixed, land-based systems, is barred for all types of ABM systems, including space-based?

(2) What is the difference between a *component*, which is subject to treaty limitation on development and testing, and parts or elements of a system, which might not be characterized as components?

(3) To what extent can dual or multi-purpose technology, which might be relevant to, or even intended for use in, ABM systems, be developed and tested in connection with other systems *not* covered by the treaty—such as anti-satellite (ASAT) systems or anti-tactical ballistic missile (ATBM) systems?

The 1985 Report to Congress on the Strategic Defense Initiative includes an Appendix entitled "Compliance of the Strategic Defense Initiative with the ABM Treaty." It sets forth the legal justification for the fifteen presently programmed SDI tests and experiments. The analysis illustrates all three problems identified above. It establishes three categories of permitted experiments: *(1)* conceptual design or laboratory testing; *(2)* "field testing" of devices that are not ABM components or prototypes of ABM components; and *(3)* "field tests" of fixed land-based ABM components—presumably permitted under Articles III, IV, and VII of the treaty, dealing with modernization of fixed land-based systems. The difficulties raised under this framework will be touched on in the analysis below.

Development

ACDA Director Gerard C. Smith was questioned on this subject by Senator Henry Jackson during the Senate hearings on approval of the ABM treaty. A written response was prepared by the administration after a thorough review of the negotiating record. It states:

The prohibitions on development contained in the ABM Treaty would start at that part of the development process where field testing is initiated on either a prototype or breadboard model. It was understood by both sides that the prohibition on "development" applies to activities involved after a component moves from the laboratory development and testing stage to the field testing stage, wherever performed. The fact that early stages of the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

development process, such as laboratory testing, would pose problems for verification by national technical means is an important consideration in reaching this definition.[19]

The definition of "development" as any work performed outside the laboratory remains the official United States position, and has been reiterated in Arms Control Impact Statements issued since the adoption of the treaty.[20]

The line that is drawn is thus a functional one, related to the method accepted by both parties for verifying compliance with treaty provisions: "national technical means of verification" (NTM). It is fair to say that if an activity cannot be monitored by NTM, it is not prohibited by the treaty; the two parties, particularly the United States, have been unwilling to accept constraints that cannot be verified. Conversely, any test of a component is prohibited if it can be observed by national technical means (or could be observed if the country in question were complying with its treaty obligation not to use "deliberate concealment measures which impede verification by national technical means"). At least, there would be a heavy burden on it to establish that such activity was mere "research," and did not amount to development or testing within the meaning of the treaty.[21]

The Compliance Appendix seems to adopt this view. It describes Category 1 experiments as preceding "field testing" and as not verifiable by NTM. The analysis relies on the quotation from Ambassador Smith's testimony reproduced above. Two of the fifteen programmed experiments and part of a third are placed in this first category of "under-roof experiments."

Components

As has been noted, Article II defines "current" components as ABM interceptor missiles, ABM launchers, and ABM radars. In addition, Agreed Statement D, dealing with exotic systems, refers to "components capable of substituting for" ABM interceptor missiles, ABM launchers, and ABM radars.

The Presidential Communication transmitting the treaty to the Senate develops this concept. It defines a component as "a device to perform the current functions of ABM launchers, interceptors, or radars."[22] It adds that devices other than these three "could be used as adjuncts to an ABM system, providing that such devices were not

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

capable of substituting for one or more of these components." But as new technology and system concepts move further away from those that prevailed in the early 1970s, these notions of "substitution" or functional equivalence become increasingly less helpful in interpreting the treaty. Systems currently under consideration may have no direct analogues to the "missiles," "launchers," or "radars" of an earlier technology. The functions previously performed by these "components" may be redistributed among the elements of the system in different ways. It is possible that a complete ABM system could be made up of elements no one of which would perform the specific functions of a missile, launcher, or radar of earlier technology.

The prohibition in Section V on the testing and development of components was specifically designed to prevent circumvention of the limitations on testing and development of systems by disaggregation. It would be ironic if this prohibition could be evaded simply by disaggregating the system along different axes than those of the original system.

The Compliance Appendix graphically illustrates the problem. The TRIAD program, begun in the Carter administration, is to be carried forward under the SDI program. It now consists of the ALPHA laser (a chemical laser), LODE/LAMP, (a precision segmented mirror with associated optics) and an Acquisition Tracking and Pointing system (ATP) consisting of a telescope and sensors for identifying and tracking the target. The laser is to generate a beam to be projected against the mirror and pointed at the target by the telescope. According to the Compliance Appendix, the ALPHA and LODE/LAMP experiments will be under roof, and are thus permissible "research." As for ATP, there "is a distinct possibility" of field tests in space in which the telescope and passive sensors, mounted in the space shuttle, would be used to measure booster plumes—i.e., would, in the language of the treaty, be "tested against ballistic missiles in flight trajectory" or "in an ABM mode." (The Appendix notes that further compliance review will be had when the shuttle mission is more precisely defined.)

The Compliance Appendix takes the position that the space test is permissible because "the experiments will use technologies which are only a part of the set of technologies ultimately required for an ABM component." Even ATP alone, however, would amount, if perfected,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

to a very significant portion of an ABM system. No doubt it could not "substitute for" a traditional ABM missile, launcher, or radar. But if so, that is because the basic system concept is different. Moreover, the three technologies together certainly seem large enough to be a "component." And they have been linked from the beginning as parts of the same program. Can it be said that because they are tested separately the treaty remains inviolate? It would seem that this is just the kind of development and testing process that the "component" provisions of the treaty were designed to bring to a halt at an early stage. In any case, even if the new system concepts seem to provide some flexibility, as the technologies become promising enough to move out from "under-roof," it will be increasingly difficult to argue that a major element of an ABM system is something less than a component just because all the elements are not tested simultaneously or do not mature at the same rate.

For a number of the projected experiments, the Appendix advances a different argument to meet the prohibition against testing "components." It asserts that the tests will be conducted at power levels or with other parameters below what is required for an ABM weapon. For instance, the Boost Surveillance and Tracking System (BSTS) will be used to measure the signature of booster plumes, a necessary aspect of boost-phase target acquisition. But the tracking satellite will not be given the computational hardware necessary to do so "in real time." Similarly, the Space Surveillance and Tracking System (SSTS) will be capable of performing functions relevant to an ABM system, but its capabilities "will be significantly less than those necessary to achieve ABM performance levels." Certainly, more is needed to avoid the strictures against "testing" an ABM component than simply turning down the power or deliberately limiting some other parameter of the device being tested. But even if the failure to reach levels of performance required for ABM capability is due to insufficiently developed technology, it is hard to see how this can avoid the treaty prohibition on testing *and development* of ABM components. The whole purpose of experiments with immature technology, after all, is to *develop* a component capable of performing the ABM mission.

Dual-purpose technologies

In the case of the Triad, legal analysis is much assisted by relatively unambiguous indications, verbal and otherwise, of the ultimate

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

object of the exercise. But purpose or intention are subjective criteria, neither observable by national technical means, nor easy to prove persuasively by other means. Thus, in the case of dual-purpose technologies that *might* achieve, but do not yet have, ABM capability, the intention of the party conducting the development will always be in doubt. This is especially so for the USSR, where weapons decisions are not required to undergo public evaluation and justification. For this reason, dual-purpose technologies present the most difficult problem of treaty interpretation, and ultimately pose the most serious threat to the existing ABM treaty.

As is discussed by Ashton Carter elsewhere in this collection, the technology for ABM systems and ASAT systems may be closely interrelated. An ABM system designed to intercept ballistic missiles in outer space will almost necessarily have an ASAT capability at some altitudes and regions in space, since the task of locating, tracking, and destroying a single satellite in orbit is much less demanding than defending against multiple missiles. Likewise, much ASAT technology has ABM implications since the basic functions of tracking, pointing, and destroying objects in space are broadly similar. Yet there is no treaty banning the testing and development of anti-satellite weapons as such. While Article XII of the ABM treaty—as well as Article XV of SALT II—prohibits interference with the other party's national *means of verification*, it is a prohibition, not against the development and testing of ASATs, but only against their *use*, specifically, against satellites performing treaty verification functions.

Anti-tactical ballistic missile (ATBM) systems were also deliberately omitted from the ABM treaty at the instance of the United States, apparently to protect the SAM-D program then under way.[23] The definition of an ABM system in Article II only includes "systems to counter *strategic* ballistic missiles." There are significant differences in trajectory, approach angle, and terminal velocity between tactical missiles (having less than intercontinental range) and ICBMs (and to a much lesser extent, SLBMs). Nevertheless, there is a good deal of overlap between the missions and functions of ABM and ATBM system components.

To the extent that these non-ABM systems pursue traditional configurations, Article VI of the treaty provides some constraints. It prevents giving "missiles, launchers or radars other than ABM missiles, launchers or radars capabilities to counter strategic ballistic

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

missiles or their elements in flight trajectory." The United States insisted on including this provision because of concern over the possible upgrading of the Soviet SAM-5 air defense system to ABM levels.[24] The U.S. Homing Overlay Experiment (HOE) of June 1984 raised questions under this provision. The test was criticized both by the Soviets and within the United States for using a Minuteman ICBM ("a missile other than an ABM interceptor missile") to bring down a reentry vehicle from another Minuteman ("to counter [a] strategic ballistic missile . . . in flight trajectory"); the experiment may also have violated the Article VI prohibition against testing non-ABM components in an ABM mode.

Defenders of the experiment argue that it was permissible under Article IV of the treaty: the system was land-based; the test was conducted at Kwajelein, a designated test site; and the interceptor was a specially modified missile using two stages of the Minuteman I plus a new third stage. Nevertheless, since Minuteman I had never been regarded as an ABM interceptor, it was not unreasonable to claim that it fell within the definition of a missile "other than an ABM interceptor missile" set forth in Article VI.

Several of the most problematic experiments in the current SDI program are rationalized on the basis that the device in question will be tested against satellites rather than ballistic missiles. Among these are the Space Surveillance and Tracking System experiment discussed above, as well as the Kinetic Kill Vehicle (a rocket-propelled projectile launched from space) and the space-based Railgun Experiment.

The basic purpose of Article VI—to prevent the upgrading of non-ABM systems—could arguably cover "exotic" as well as conventional systems. The application of the Article to systems incorporating exotic technologies is problematic, however, because its express language deals only with familiar elements (missiles, launchers, and radars) and does not use the general term "components" found elsewhere in the treaty. Even if we were to accept such an inferential extension of Article VI to newer technologies, it would prohibit only the final act of "upgrading"—giving the system "capabilities to counter strategic ballistic missiles . . . in flight trajectory." Development, testing, and even deployment of such sub-ABM systems would not be barred so long as they do not possess the prohibited capabilities. SDI program experiments conducted against satellites with power levels or other performance criteria below that required for

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ABM missions are apparently justified on this basis. Nevertheless, if such a system were deployed, the potential for upgrade might make or appear to make a sudden breakout from treaty limitations feasible, and even, in certain political circumstances, more likely.

A useful litmus test in these cases of exotic dual-purpose technologies would be whether the United States would consider the Soviets in violation if they conducted the same experiments. It seems likely that, in the past, the United States would have raised serious questions as to the compliance of such activities with the treaty. Thus, it has taken a "strict constructionist" position in suggesting that the Soviet SAM–12 might have or easily be given ABM capability, or that certain radars were "mobile" because of the short installation time. In the context of the current SDI program, however, the United States might be willing to accede to a broader range of Soviet experiments as a way of validating its own. That would come close, in effect, to a tacit amendment of the treaty to eliminate the prohibition against the development of ABM systems—an amendment that would be operative *before* there was a basis for deciding whether the new systems would ultimately provide more security than the existing treaty.

It should be noted here that there is one particular exotic technology not subject to these vagaries of interpretation: that is a space-based X-ray laser powered by a nuclear explosion. The nuclear component of such a system would run into legal constraints quite apart from the ABM treaty. Testing of the system in space would be prohibited by the Limited Test Ban Treaty.[25] Article I of that treaty prohibits "any nuclear weapons test explosion, *or any other nuclear explosion* . . . in . . . outer space. . . ." The testing prohibition applies regardless of whether the nuclear component is characterized as a "weapon." Moreover, if it *is* regarded as a "weapon" and is to remain stationed in space for a period before it is used, it would also run afoul of the Outer Space Treaty's undertaking "not to place in orbit around the Earth any objects carrying nuclear weapons."[26]

As for ATBM systems, there would be room for doubt about the true purpose of a U.S. program justified under that rubric. There is no military threat to the United States from tactical ballistic missiles; ATBM systems would only be developed for use in defense of Western Europe. Since no such program could be seriously undertaken without extensive consultation and advance agreement from the NATO allies—something that has not yet taken place—any extensive

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

U.S. ATBM activity undertaken *without* NATO approval would most likely be a subterfuge for ABM work.

The Soviet situation is different. The Pershing II deployment in Western Europe furnishes the Soviets with a military justification for ATBM development. On this analysis, Soviet ATBM activity would not be prohibited so long as it did not achieve the capability to intercept strategic ballistic missiles in flight trajectory. Nevertheless, it hardly needs saying that the United States is unlikely to accept a reading of the treaty in which ATBM development is forbidden to the United States but not the Soviet Union.

Issues of treaty interpretation—such as those discussed above—can never be resolved definitively. No court or other third party tribunal sits with jurisdiction to answer such questions authoritatively. At the same time, the interpretation of treaties, like other legal instruments, consists of more than playing games with words to see what stretched constructions they can be made to bear. The enterprise is subject to the universal maxim that cases of genuine doubt are to be resolved so as to further, not frustrate, the basic purposes of the instrument. In the case of the ABM treaty, the basic purpose is clear and appears in the opening words: "Each party undertakes to limit anti-ballistic missile systems. . . ." In light of this fundamental objective, there is little doubt how the questions that have been raised about the coverage of the treaty should be answered.

Yet neither the United States nor the Soviet Union seems to have adopted a strict constructionist approach to questions that arise under the treaty. Instead, each seems to be embarking unilaterally on an expanding series of programs, more or less defensible on technical legal grounds. Individually and cumulatively, however, such activities may have considerable ABM potential. The likely outcome of this behavior is that even without unequivocal treaty violations, both parties will be deprived of the assurance they had sought from the ABM treaty: that the other party would not prepare a "break-out" from the basic prohibition against deployment of ABM systems. The resulting insecurity will itself contribute to the erosion of the treaty, and to the deterioration of the relationship between the parties.

It would clarify the existing legal and political situation if the two nations were to negotiate new agreements specifically addressed to ASAT and ATBM systems. The agreements might prohibit outright the development, testing, and deployment of such systems. At the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

very least, they could define with greater precision the scope and capabilities of ASAT and ATBM programs and deployments both sides are willing to live with. It may not be too much to say that only such a clarifying agreement can save the ABM treaty from eroding away as a result of gradual encroachments on the part of the two countries.

COMPLIANCE

Although no courts have jurisdiction over the interpretation or enforcement of the ABM treaty, and no formal sanctions exist for breach, the treaty does contain an important innovation in the area of compliance. Article XIII establishes a Standing Consultative Commission (SCC) "to promote the objectives and implementation of the provisions of this treaty. . . ." The principal function of the commission is "to consider questions concerning compliance with the obligations assumed and related situations which may be considered ambiguous"; the SALT I interim agreement, SALT II, and the 1971 Accident Measures Agreement give the SCC similar functions with respect to their provisions.

The Standing Consultative Commission consists of a commissioner and deputy commissioner from each side, supported by appropriate staff and advisory personnel. It meets twice a year, and its proceedings are confidential. It has no permanent secretariat or offices and no independent authority to make decisions or treaty interpretations. Commissioners act only on instructions from their governments. On important matters, the U.S. commissioner's instructions are approved by the president.

The commission is essentially a continuing and expert body for regular and confidential consultation between the parties. Issues concerning compliance and interpretation that may arise under the treaties may be referred to the commission, which attempts to clarify uncertainties and ambiguities and thus to maintain the confidence of the parties in the continued integrity of the agreement. Although discussion of compliance issues presumably generates pressure for adherence to treaty requirements, the commission is not, strictly speaking, an enforcement agency. It is not well-suited to deal with accusation or confrontation. It operates in a setting where each side, through NTM and other intelligence, possesses extensive but incom-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

plete information about the other, but neither knows exactly what the other knows. The commission is thus an agency through which a party, by providing "on a voluntary basis such information as either party considers necessary to assure confidence in compliance,"[27] can persuasively assure the other that it is in fact carrying out its obligations.

The experience with the SCC may be roughly divided into two periods, the first lasting from 1972, when the commission was organized, until 1980; the second, from 1980 to the present. Public information about the first period is derived primarily from accounts published by the State Department in 1979 in connection with Senate consideration of SALT II.[28] During that period, eight compliance-related issues were raised by the United States, five by the Soviet Union. Only a few of these involved the ABM treaty.

For the most part, the issues were minor, turning on technical questions of treaty interpretation or minor uncertainties about the factual situation observed. The most important question raised by the United States was whether a Soviet SA-5 air defense radar had been "tested in an ABM mode"—by being used to track an incoming missile during a test flight—in violation of Article VI of the ABM treaty. The United States acknowledged that the activity was ambiguous and the Soviet Union maintained that it had not violated the treaty. Nevertheless, according to the State Department report, shortly after the issue was raised the Soviets stopped this tracking activity, although subsequently the United States has complained of sporadic resumption. Discussion in the SCC over a period of several years has resulted in some clarification concerning the meaning of "testing in an ABM mode"—a clarification that the U.S. had sought since the initial negotiation of the treaty. Other complaints by the United States in this period were, on the whole, resolved satisfactorily, either by cessation of the questionable activity or by the supply of information that, in connection with NTM, satisfied the United States that the activity was not prohibited by the treaty.

The most serious Soviet complaint against the U.S. concerned the use, beginning in 1973, of 2700-square-foot environmental shelters to shield Minuteman silos that were being hardened at Malmstrom Air Force Base. The Soviets claimed that this practice violated the obligation of Article V of the Interim Agreement "not to use deliberate concealment measures which impede verification by na-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tional technical means. . . ." In 1977, the United States reduced the size of these shelters, but they were not completely removed until the conclusion of the SALT II negotiations in 1979. The United States has maintained that other actions questioned by the Soviets were in compliance with the treaty, and therefore did not require modification of conduct.

The experience during the second period of the SCC's history is far less satisfactory. On February 1, 1985 a White House Compliance Report to Congress stated: "The U.S. Government judges . . . that the new large phased-array radar under construction at Krasnoyarsk constitutes a violation of legal obligations under the Anti-Ballistic Missile Treaty of 1972."[29] The report also cited, with varying degrees of certainty, Soviet violation of a number of other treaties and commitments in the security field. The USSR has responded in kind, making similar wide-ranging accusations against the United States, including the charge that U.S. radar deployments were in violation of commitments under the ABM treaty. Some of these charges reopened issues the United States thought had been settled in the earlier period. The most recent barrage of accusations has continued for more than a year now, with most of the conflicts having been formally raised within the commission before being publicly aired.

Unlike the complaints brought before the SCC in the earlier period, current charges raise questions of compliance with major substantive obligations under the treaty. Since much of the supporting evidence is classified, it is difficult to make a judgment on the merits of the claims. As to the charges made by the United States, it is undisputed that the Soviet Union is constructing a large phased-array radar near Krasnoyarsk in Siberia. Since it is sited more than 700 kilometers from the nearest frontier and oriented northeast, it cannot be said to be located "along the periphery of its national territory and oriented outward," as is required for early-warning radars under Article VI. Agreed Statement F prohibits large phased-array radars in other locations "except for the purposes of tracking objects in outer space or for use as national technical means of verification." The Soviets claim that the radar is for space tracking, but the United States says its technical features are not consistent with a space-track mission. The Soviets have countered that once the radar is completed it will be apparent that it is designed to track objects in outer space. The great weight of expert opinion in and out of government at this writing is

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

that the device at Krasnoyarsk is an early-warning radar not distinguishable from other early-warning radars. Its position and orientation has very limited utility for satellite tracking. There has been some suggestion that the radar may be designed for use in conjunction with the Soviet ASAT program.[30] If so, it might be characterized as a space-tracking radar and therefore be permitted by the treaty. In that case, since the radar would also have early-warning capability, this would be another illustration of the problems raised by overlapping and multiple purpose technologies.

The Soviet Union, for its part, challenges U.S. phased-array radar deployments, which it says can be used as a basis for a nationwide ABM defense, thus violating Article I of the treaty.[31] In addition to installations in Massachusetts and California, examples that had previously been raised in the SCC, the Soviets pointed to new U.S. deployments "in a southern direction." This presumably is a reference to large phased-array radars now being constructed in Georgia and Texas. These are perhaps close enough to the continental boundary to be "on the periphery" of the United States, but since their angle of coverage is said to be 240 degrees, they are at least arguably not "oriented outward."

Despite charges by both superpowers of serious breaches of the treaty, neither party has yet withdrawn from the treaty or indicated any intention of doing so. Perhaps this reticence reflects the remaining uncertainties in the parties' knowledge of the facts. But it is also surely a recognition of the huge political costs, both domestic and international, that would be involved in formal abrogation of the treaty.

The resulting situation is very unsatisfactory: the charges made by both sides remain on the record, and provide a basis for deprecating the importance of complying with the treaty in discussions of the SDI and other programs. Meanwhile, both the United States and the Soviet Union are proceeding with programs, particularly in the ASAT and ATBM area, that are of dubious validity under the treaty, and are justifying them with increasingly casuistic arguments. All of this combines to erode confidence in the treaty, and may perhaps reach a point where the political costs of withdrawal would become acceptable.

This is not the process contemplated by the treaty. Questions of compliance and disputes about treaty interpretation were to be taken

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

to the SCC and discussed there in good faith, in confidence, and with a view to resolving them on a mutually agreeable basis. It is hard to be satisfied today that either party is following this injunction, or availing itself of the opportunity provided in the SCC to resolve ambiguities and provide assurance of compliance with treaty obligations. Instead, the dominant political tone of confrontation between the United States and the Soviet Union has saturated the proceedings of the SCC and reduced its utility for the central questions on its agenda.

SUMMARY AND CONCLUSIONS

There is a framework of legal principles and treaty obligations—fragmentary and incomplete, perhaps—governing military activities in outer space. As we have seen, the Outer Space Treaty enunciates principles of international cooperation and the use of space for peaceful purposes. We have also seen that, from the beginning, this goal was broadly understood to accommodate passive military uses such as reconnaissance and communications. The positive rules of law laid down by the Outer Space Treaty, on the other hand, are much narrower in scope. One of them prohibits nuclear weapons in orbit. This, taken together with the ban in the Limited Test Ban Treaty on nuclear explosions in outer space, has a decisive bearing on a narrow range of ABM and ASAT technology, specifically, the use of nuclear explosions in space as a power source for lasers.

The principal legal rules relevant to SDI activities are articulated in the amended ABM treaty. These rules call for:

(1) prohibition of the development, testing, and deployment of space-based ABMs and ABM components, whether dependent on existing or exotic technologies. This prohibition also applies to air-based, sea-based, and mobile land-based ABMs and ABM components, that is, to everything but fixed land-based systems and components;

(2) prohibition on the deployment of fixed, land-based ABM systems and components, except at a single designated site not more than 150 kilometers in radius, centered on the national capitol or a missile silo field, and containing not more than one hundred launchers;

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

(3) no prohibition on the development and testing of fixed, land-based ABMs and ABM components of traditional technologies at existing test ranges;

(4) prohibition of deployment of exotic ABM technologies even if fixed and land-based, and even at the existing test ranges, except after discussion and agreement with the other party;

(5) prohibition on upgrading non-ABM missiles, launchers, and radars to an ABM capability, or on testing them in an ABM mode, and, arguably, by inference, restriction of upgrading components (that are not missiles, launchers, or radars) of sub-ABM systems to ABM capability;

(6) no prohibition against research.

It is apparent that the SDI enterprise as a whole, its objectives and philosophy, are simply at odds with the purposes and objectives of this treaty. Moreover, whatever the exact technical limits on testing and development may be—the difference between "research" and "development," between a "component" and something else—it is inevitable that under the current presidential mandate and Defense Department response, these limits will be breached and the treaty violated outright within a period of time that is relatively short compared to the time it would take to develop, evaluate, and deploy SDI technologies and systems. Attempts to develop ABM technologies under the label of ASAT or ATBM programs would be legally disingenuous, technically costly, and in any event could only extend arguably permissible development a few years. Meanwhile, the interrelation of ASAT and ABM technology will continue to generate disputes over the legality of particular actions under the treaty. While these issues could be addressed and perhaps resolved ad hoc by a well-functioning SCC, it would be far better—indeed, it may be essential to the continued viability of the treaty—to eliminate the source of these disputes by calling a prompt mutual moratorium on ASAT testing, followed by serious negotiation of a treaty to define the limits of ASAT activity. The successful conclusion of such a treaty would have intrinsic merit apart from its clarifying impact on the ABM treaty.

The ABM treaty is not the embodiment of ultimate truth. It represents a judgment, at least by the United States, that its security is enhanced and the stability of the strategic balance strengthened if

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

both sides forswear defensive systems. Like other legal arrangements, this treaty may be subject to revision in the light of changing technology or reconsideration of the values at stake. It has been suggested, for example, that even within the general framework of deterrence theory, point defense of silos might be an effective way of protecting ICBMs during a period of strategic arms reduction. This would be permissible to a limited extent under the current ABM treaty. The scope of permitted terminal defenses could be extended by relatively modest amendments to the treaty (subject, of course, to Senate approval).

The SDI embodies a much more far-reaching, indeed, a fundamental challenge to the policy assumptions of the treaty. It may be that the government and people of the United States will decide to make such a drastic change in direction. If so, the way to do it is not by nibbling away at the ABM treaty. By engaging in legalistic—not to say sophistic—interpretations that bend the treaty's language and torture its basic meaning, we do not "preserve" or "comply with" a treaty. And in the process, we are not only undermining the ABM treaty, we are severely compromising the possibility of confident reliance on all present or future arms-control regimes. It would be more straightforward to invoke the process prescribed by the treaty to amend it or withdraw from it in accordance with its terms. Until this is done, however, the United States is bound by the treaty as it stands, and thus not only by constraints under international law, but by obligations that are, under the Constitution, "the supreme law of the land."

ENDNOTES

[1]*Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies,* January 27, 1967, 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205 (hereafter cited as Outer Space Treaty).

[2]*Treaty Between the United States and the U.S.S.R. on the Limitation of Anti-Ballistic Missile Systems,* October 3, 1972, 23 U.S.T. 3435, T.I.A.S. No. 7503 (hereafter cited as ABM treaty).

[3]McGeorge Bundy, George Kennan, Robert McNamara, Gerard Smith, "The President's Choice: Star Wars or Arms Control," *Foreign Affairs*, Winter 1984–85.

[4]*Soviet Compliance with Arms Control Agreements*, State Department Special Report no. 122, Feb. 1, 1985.

[5]Outer Space Treaty, Article II.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

[6]Outer Space Treaty, Preamble, Article IV.
[7]Outer Space Treaty, Article IV.
[8]Article IX of the SALT II accords did forbid the development, testing, or deployment of fractional orbital missiles (FOBS). FOBS must be distinguished from ICBMs, however, because ordinary ICBMs are not considered to be in orbit.
[9]Raymond Garthoff, correspondence in *International Security,* Summer 1977, pp. 107–09.
[10]ABM Treaty, Article V (1).
[11]The Communication of the President transmitting the treaty and recommending that the Senate advise and consent to ratification, explains the interaction of the clauses of the treaty:

> *Future ABM Systems*
>
> A potential problem dealt with by the Treaty is that which would be created if an ABM system were developed in the future which did not consist of interceptor missiles, launchers, and radars. The treaty would not permit the deployment of such a system or of components thereof capable of substituting for ABM interceptor missiles, launchers or radars: Article II (1) defines an ABM system in terms of its function as "a system to counter strategic ballistic missiles or their elements in flight trajectory," noting that such systems "currently" consist of ABM interceptor missiles, ABM launchers, and ABM radars. Article III contains a prohibition on the deployment of ABM systems or their components except as specified therein, and it permits deployment only of ABM interceptor missiles, ABM launchers, and ABM radars. . . .

The presidential statement makes it clear that development of even these components is forbidden for any other than fixed land-based systems:

> *Development, Testing, and Other Limitations*
>
> Article V limits development and testing, as well as deployment of certain types of ABM systems and components. Paragraph V (1) limits such activities to fixed, land-based ABM systems and components by prohibiting the development, testing, or deployment of ABM systems or components which are sea-based, air-based, or mobile land-based. . . .

See the *Communication from the President of the United States, Transmitting Copies of the Treaty on the Limitation of Anti-Ballistic Missile Systems and the Interim Agreement on Certain Measures with Respect to the Limitation of Strategic Offensive Arms,* 92nd Congress, 2nd sess., 1972, House Doc. 311, pp. 9–10.

[12]*Strategic Arms Limitation Agreements, Hearings Before the Senate Committee on Foreign Relations on Executive L. 92–2,* pp. 5–6 (testimony of Secy. of State Rogers); see also, *Agreement on Limitation of Strategic Offensive Weapons, Hearing Before the House Committee on Foreign Affairs,* 92nd Congress, 2nd sess., 1972, p. 5 (statement of Secy. of State Rogers, reemphasizing the absolute ban on development, testing, and deployment of space-based systems and the ban on deployment of "exotic" ABM systems even on fixed, land-based sites).
[13]*Military Implications of the Treaty on Limitation of Anti-Ballistic Missile Systems and the Interim Agreement on Limitation of Strategic Offensive Arms, Hearing before the Senate Committee on Armed Services,* 92nd Congress, 2nd sess., 1972,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

pp. 40–41 (answers to prepared questions supplied by Secy. of Defense Laird): "There is, however, a prohibition on the development, testing, or deployment of ABM systems which are space-based. . . . There are no restrictions on the development of lasers for fixed, land-based ABM systems. The sides have agreed, however, that deployment of such systems which would be capable of substituting for current ABM components . . . shall be subject to discussion. . . ."

[14]*United States-Soviet Relations, Hearings before the Senate Committee on Foreign Relations,* 98th Congress, 1st sess., 1983, p. 180 (prepared statement by Hon. Gerard Smith): "Very briefly, my understanding of the ABM Treaty is that . . . [d]evelopment, testing, and deployment of sea, air, space, or mobile land-based systems was banned; [i]f land-based systems are developed using so-called 'exotic' components—lasers, particle accelerators, etc.—they could not be deployed unless the treaty was amended."

[15]See *Treaty on Limitation of Anti-Ballistic Missile Systems, Report of the Senate Committee on Foreign Relations,* 92nd Congress, 2nd sess., 1972, p. 3.

[16]See *Congressional Record,* August 3, 1972, 92nd Congress, 2nd sess., S. 26703 (statement of Sen. Buckley asserting that the treaty banned all space development of laser ABMs).

[17]*Fiscal Year 1984 Control Impact Statements,* 98th Congress, 1st sess., 1983, pp. 266–67, as well as the relevant sections of the Arms Control Impact Statements for fiscal years 1979 through 1983.

[18]See, e.g., *Controlling Space Weapons, Hearings before the Senate Committee on Foreign Relations,* 98th Congress, 1st sess., 1983; *United States-Soviet Relations,* loc. cit. (testimony of Hon. Gerard Smith).

[19]*Military Implications of the Treaty on the Limitations of Anti-Ballistic Missile Systems,* op. cit., p. 377.

[20]*Fiscal Year 1984 Arms Control Impact Statements,* op. cit.

[21]The Russian text of Article V uses the word *sozdavat,* which translates more nearly as "create" rather than "develop." This may lay the basis for an even narrower reading of permitted research.

[22]*Communication from the President,* op. cit.

[23]Interview with Dean Albert Carnesale, John F. Kennedy School of Government, Harvard University, formerly Senior Advisor to Head of SALT I delegation.

[24]Ibid.

[25]*Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water,* Oct. 10, 1963, 14 U.S.T. 1313, T.I.A.S. No. 5433, 480 U.N.T.S. 43.

[26]Outer Space Treaty, Article IV, op. cit.

[27]ABM treaty, Article XIII, op. cit.

[28]See, e.g., *Compliance with I Agreements,* U.S. Dept. of State, Special Report no. 55, July 1979.

[29]*Soviet Non-Compliance with Arms Control Agreements,* op. cit.

[30]*Arms Control Treaty Compliance,* Federation of American Scientists Public Interest Report, *Journal of the Federation of American Scientists,* March 1984.

[31]USSR Aide Memoire to the U.S. on Arms Violations, *Foreign Broadcast Information Service: Soviet Union,* Jan. 30, 1984, pp. AA1–AA5.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

John C. Toomay

The Case for Ballistic Missile Defense

WITH HIS STRATEGIC DEFENSE INITIATIVE, President Reagan has called on American scientists and engineers to devise a defense against nuclear ballistic missiles. In proposing that the United States switch from an offense-oriented to a defense-oriented strategic policy, the president has sparked a lively public debate about the merits of such a policy. As he noted in his March 1983 address, our current strategic policy is to deter aggression through the promise of retaliation. Deterrence has worked, and we have averted a nuclear exchange of any kind, for over forty years. But I believe we cannot afford to be complacent about changes that have occurred in the strategic balance over these years. As a member of the Defensive Technologies Study Team (Fletcher panel) that advised the president, I am persuaded that an increased effort to develop ballistic missile defenses is a wise course for the United States.

THE DETERRENCE EQUATION

Deterrence has become a complex and subtle matter. The fine points of how to maintain deterrence in peacetime, in crisis, even during war, have been the subject of much discussion. But the basic concept of deterrence is relatively simple. The word itself comes from the Latin, meaning "from fear": deterrence is the state of not acting for fear of the consequences. Gen. Russell Dougherty, former head of the Strategic Air Command, has described it as the product of military capability and the will to use it.[1] In the case of nuclear deterrence, we must pay far more attention to our opponent's capabilities—the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

weapons and the means of using them—than to his will. We cannot gamble that he might be lacking in will, when the consequences of being wrong are so grave. Therefore, our current strategic posture is based substantially on the power of our offensive forces. It emphasizes the *capabilities* of the Soviets rather than their intent. We do not question that the Soviets have the will to act; instead, we make conservative estimates of the capabilities of Soviet strategic forces and assume they will use them in the way most destructive to our interests.

Our deterrence equation must also take into account our estimate of what the Soviets believe is unacceptable damage to their country. Because we have little confidence in our abilities to probe the psyches of Soviet leaders, our estimate is again very conservative. Our strategic force requirements are determined by working backward from the level of potential damage that we are confident will ensure deterrence. We believe we can deter the Soviets if their calculations always show that we are capable of inflicting unacceptable damage on them in retaliation, even after they have executed an all-out surprise attack against us.

Our ability to gauge what deters the Soviets has been sufficient to avert a nuclear exchange of any kind for over forty years. I assert that this is evidence that deterrence has worked. We seem to accept these decades of deterrence quite casually, even complacently, for two reasons. The first is manifest: human nature comes to accept the status quo as natural. The second is vital: until recently, the margin of our advantage over the Soviets in strategic forces has been wide. Even very large errors in our estimates of Soviet intent or Soviet capability would not have significantly changed the equation.

Today, however, the situation is less sanguine: the relation is one that some call "rough parity." There is much debate over the significance of this shifted balance. Devotees of minimum deterrence argue that when both superpowers have thousands of nuclear weapons only a few hundred of which are capable of inflicting massive damage, an increase in numbers, no matter how asymmetrical the result, is irrelevant and therefore cannot jeopardize deterrence. Advocates of stronger strategic forces, on the other hand, warn that any imbalance encourages Soviet intransigence and adventurism, and a gross imbalance might invite a limited nuclear attack, which could easily escalate into a massive exchange.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

We have no way of knowing, before the fact, which of these two interpretations is correct. Yet we can reflect on the experiences we have had. The Cuban Missile Crisis of 1962 is often cited as an example of Soviet accommodation to our nuclear superiority; in contrast, Soviet stubbornness during the intermediate nuclear force (INF) negotiations of 1981–83 is seen as an example of Soviet implacability in our present world of "parity." Such evidence is anecdotal and hence not altogether convincing. Perhaps we need to address the matter in a different way: what have we gained by letting our strategic superiority erode, and what have we risked? The benefits have presumably included reduced expenditures on strategic forces, reduced numbers of nuclear weapons, and an international reputation as a peace-seeking nation. The world has not been made a safer place, however, nor has nuclear war been made less likely by such erosion. The potential risks from an eroded strategic posture are far more onerous. They include new wars of national liberation, major incursions into, for example, Europe, or actual nuclear exchanges and loss of sovereignty and freedom.

We have tried various stratagems since the mid-1960s to sustain our strategic position. At first, we sought to preserve superiority; this was followed by "balance"; then came, in rapid succession, "essential equivalence" and "countervailing forces"—all euphemisms for a declining strategic margin. During much of the 1960s and 1970s, we cut the budget for nuclear forces almost every year. We have made some efforts to bolster our strategic forces, though with mixed results. The B-1 bomber, at first cancelled, has been revived, though in drastically reduced numbers. The MX has been approved, though again in reduced numbers. Minuteman's accuracy and hardening have been improved, cruise missiles are being deployed on bombers, and Trident submarines are operational.

Nevertheless, our efforts pale beside those of the Soviets, whose massive buildups have now spanned over twenty years and have brought them parity in numbers of strategic warheads and superiority in total explosive power. Moreover, the Soviets have devoted themselves to the full range of strategic forces, including defenses. They have maintained and are now improving their ABM system around Moscow; their air defense network is extensive; Soviet civil defense preparations are vastly greater than our own; and they are pressing ahead with advanced ballistic missile defense technologies.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The United States has also tried detente and arms control as methods of stabilizing the strategic balance. The SALT negotiations may have diverted, but they did not halt, the Soviet buildup of forces; our efforts at limiting strategic arms by negotiations have proved disappointing. As things now stand, we are frustrated in our dealings with the Soviets, we have no consensus at home about what our policy should be, and our media's recent focus on the horrors of nuclear war has unsettled us. What we are in need of is a new approach, one that might allow us to escape our current dilemmas while still preserving viable strategic forces. The addition of strategic defenses to our national policy serves just this function.

To discuss the promise of ballistic missile defense, we must first consider what the Strategic Defense Initiative refers to as "intermediate capabilities."[2] I will begin by examining those types of defense that raise relatively clear issues—defense of valuable hard targets, local area defense, and light area defense—and move gradually to consider full, "perfect" defense of the nation, the most contentious issue. (It will be useful, throughout the discussion, to bear in mind that these defenses could also be useful for our allies and in some cases would demand deployment by them.) We will trace how these defenses would carry us from the offense-oriented deterrence we now know to a potentially more powerful, but certainly less familiar, defense-oriented strategy.

HARD-POINT DEFENSE

One dimension of the Soviet strategic buildup that must concern us is the increase in their number of highly accurate, high-yield ICBM warheads appropriate for attacking U.S. deterrence forces and other hardened military targets. Carrying out such an attack would by no means be an easy task, as the Scowcroft Commission has pointed out. Yet when the Soviets devote so much effort and resources to acquiring a military capability, we must take seriously the potential threat that it poses. While hard-point defenses of our retaliatory forces were not explicitly addressed by the Fletcher panel (they had, after all, been studied almost continuously since the early 1960s), the possibility was examined by the Hoffman panel, which came out in support of such a policy.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Hard-point defenses would complement deterrence in a straightforward manner. Our present retaliatory forces achieve survivability in many ways: bombers are launched on warning (mobility); submarines patrol under the oceans (mobility and concealment); and land-based ICBMs are deployed in silos (hardening). As the accuracy of Soviet ICBMs has improved, however, the ability of our hardened silos to withstand attack has become a matter of acute concern. Of the several ways to preserve or reestablish the survivability of our ICBMs, defense shows considerable promise. Hard-point defenses are an alternative to deploying more offensive forces in order to maintain the strategic balance. Instead of installing an offensive missile in yet another silo, a defensive interceptor could be deployed to destroy an attacking warhead before it reaches the silo. Conceptually, either of these methods increases the survivability of our retaliatory forces. The choice a country makes would depend on the cost-effectiveness of offensive versus defensive systems and their political and diplomatic ramifications. Three factors so far seem to have prevented the United States from deploying hard-point defenses: the existence of the ABM treaty, uncertainties about the importance of ICBM "vulnerability," and disagreements about what should be done to rectify it.

It is difficult for most people to grasp that the time to act on the survivability of our land-based ICBMs is while their effectiveness is still intact. This point deserves emphasis. If we wait until the threat to our retaliatory forces is unambiguously clear, we will have plunged ourselves into a situation of great strategic instability. Since it takes a decade or more to design, develop, and deploy any major weapons innovation, the time to begin improving our forces is long before the danger actually confronts us.

In our past calculations of what we needed for effective deterrence, we have always presumed that the Soviets would make a massive attack against our Minuteman ICBMs—as well as many other targets—and that only a fraction of them would survive. The role of active defenses would be to assure survival of at least this fraction in the face of an increasing Soviet threat. One tactic available to us is preferential defense. In preferential defense, the defender marshals his resources (in this case BMD interceptors) to defend only a limited number of points he has secretly selected. If the defender concentrates his defense effort to protect a few targets, the attacker must also increase the size of his attack on those targets if he wishes to destroy

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

them. But if the attacker does not know in advance which targets will be defended, he must increase the magnitude of his attack on *all* targets. Just a few BMD interceptors on the part of the defense, therefore, forces the offense to multiply his forces manyfold—or develop a wholly new tactic.[3] To be effective, a preferential defense system must be able both to defend itself and to give the *appearance* of being able to defend an area much wider than the few targets actually selected.

Some systems being considered for defense of future land-based ICBM systems would have even greater leverage. For example, a system could combine defense with deceptive missile basing, which would move a relatively small number of ICBMs among a very large number of shelters. Because the location of each missile would be kept secret, the enemy would be compelled to attack all the shelters to be sure of destroying the missiles hidden within some of them. One defensive interceptor accompanying each ICBM would approximately double the number of warheads required to destroy all the missiles. If there were two hundred ICBMs and four thousand shelters, for instance, the enemy might consider an attack with four thousand warheads to be adequate. But if each ICBM were protected by an interceptor, the enemy would have to target *two* warheads on each shelter—or eight thousand warheads in all—in order to be successful.[4]

The small, hard-mobile ICBM—or Midgetman—system that is recommended by the president's Commission on Strategic Forces has some inherent suitability for such high-leverage defense. In this system, the missiles would be moved randomly on mobile launchers over government land in the Southwest. Since the Soviets would not know where each launcher was at any moment, but would presumably know the bounds of the overall deployment area, they would have to barrage the entire area with warheads to destroy the missiles. A mobile launcher is inherently a softer target than a silo and may potentially be damaged even by warheads that explode a considerable distance away, thus making it harder for a limited defense to protect the missile. Still, if an interceptor (and its associated equipment) accompanied each missile and shot only at those warheads that would destroy the missile, the warhead requirements for the Soviets would be doubled.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

There is little doubt of the cost-effectiveness of such defenses. The Soviets would be hard-pressed to add, say, four thousand warheads to their strategic arsenal for every two hundred interceptors and associated equipment we deploy. The marginal cost to the attacker of adding another warhead to his missile force and modifying his post-boost vehicles seems to be about $3 million apiece—or $12 billion for four thousand additional warheads. A modern BMD interceptor would cost somewhat less than $3 million, although the two hundred small radars and the complex system integration equipment would be expensive, perhaps $10 million per missile—or $2 to $3 billion for the whole system. These ratios favor the defense by about five to one. Adding a second round of interceptors would increase the leverage even more.

Hard-site defenses also have very favorable attributes from the perspective of strategic arms control. They add to deterrence because they protect retaliatory forces while leaving urban-industrial targets unprotected, and they add to stability because they do not threaten either the cities or the forces of the other side. They have the additional advantage of providing the command authority with more time to make crucial decisions. Of course, the ABM treaty, as amended, allows each side to defend either an area containing missile silos, or its national capital. The forces permitted by the treaty (only one hundred interceptors) are insufficient for creating an effective overall defense, however. Thus, even a defense that is almost wholly in accord with the principles of strategic arms control would require renegotiation of the ABM treaty for deployment. Verification of limitations on such defenses would be feasible in several ways, although on-site inspection would probably be required.

It is inappropriate to leave off discussion of these high-leverage defense systems without noting their technical difficulties. Unless the ICBM launchers or shelters can be made as hard as their advocates claim, and the exact location of the missiles at any moment kept secret, preferential defense will lose its effectiveness. And unless the defense radars (or other sensors) are as hardened as the missiles they are protecting, or are rapidly replaceable if damaged, an attacker could degrade or nullify the defense by attacking its weakest part. The offense might try other clever tactics: shoot-look-shoot, nuclear blackout of the defense radars, or maneuvering warheads. Shoot-look-shoot entails risks, because while the attacker is looking, we

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

could be retaliating with the ICBMs that survived the first strike. Nuclear blackout is not so effective against a preferential defense that is able to intercept warheads in the last seconds of flight. And maneuvering vehicles lose velocity and accuracy very rapidly when making hard turns at low altitudes. All these countermeasures deserve further investigation as part of a BMD program.

In sum, there are important factors favoring ballistic missile defense of our land-based ICBMs. Furthermore, we foresee no apparent detrimental effects if the Soviets should also deploy such defenses, within reasonable constraints. The technical and political problems do not seem insurmountable; it is rather an inchoate public suspicion of defense, and apprehensions about tampering with the ABM treaty, that are the obstacles to be overcome.

LOCAL AREA DEFENSES

Another "intermediate" defense option would be defense of valuable, but not necessarily hardened, targets or clumps of targets such as air bases, command-and-control centers, and seaports. This was addressed explicitly by the Hoffman study and implicitly by the Fletcher panel and so is a legitimate option within the SDI.

The merits of defense for such local area targets are not so easy to state as for land-based ICBM forces. Many of these targets are in or near cities and most are soft. The technical problems of defense are greater because incoming warheads have to be intercepted much farther away. And where such targets are few in number and the survival of each quite important, preferential defense may not be feasible—any or all of them might be destroyed by a concentrated attack. Given these target characteristics, it would usually be more cost effective as a first step to try more conventional means of protection: proliferation, mobility, secrecy, hardening, or some combination of these.

Over the years, studies have been made of ballistic missile defense for some valuable targets such as strategic bomber bases. Currently, we ensure that a significant fraction of our bombers will survive attack by putting them on twenty-four-hour alert, ready to take off on warning of attack. During crises, the fraction on alert can be raised and the bombers dispersed to other bases. Defending bomber bases arguably offers two advantages over these procedures: it would

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

also protect that portion of the bomber force not on alert, and it would increase the survivability of airfields after a nuclear exchange. Yet defending the bases would probably be the most expensive way of guaranteeing the survival of bombers. A full defense of airfields would have to intercept large numbers of SLBMs, ICBMs, and cruise missiles—all of which the Soviets could place on target almost at their leisure, because once our alert forces have departed, the remaining planes are slow to respond. Moreover, defense of bomber bases presumes nuclear war-fighting and protracted nuclear war. It thus raises the question whether money spent on defending air bases might be better spent on forces that would increase deterrence and prevent nuclear exchanges in the first place.

As for command-and-control centers, increasing their numbers seems a more efficient way to ensure continued operations. Suggestions that we defend them seem to stem more from a sense that it would be easier to obtain funding for defense than for adequate command-and-control facilities themselves. But if we think of the national command authority (NCA) as people, rather than facilities, the issue is more easily resolved. The whereabouts of the president and secretary of defense at the start of an attack can never be anticipated, so their safety can never be fully guaranteed. Short of an almost leak-proof whole-country defense, the most effective tactic for preserving command authorities is to equip and train the NCA hierarchy and staff.

For similar reasons, defense of seaports probably does not make sense. The number of major seaports is small, they are soft targets, and they tend to be far apart. The Soviets could simply overwhelm the defenses if they choose to make a large enough attack. More important, however, seaports are more of a military convenience than a necessity. The Soviets could not stop the flow of goods to our allies by attacking seaports. There are far too many ways to transport material of all kinds: over the beaches; by air; through improvised ports; or through the small ports, marinas, and piers that dot our 23,000 miles of coastline.

Defending various valuable but soft targets with local area defenses, then, does not seem promising.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

LIGHT AREA DEFENSES

So-called "light area defenses" would be a step beyond local area defenses. They would protect the country as a whole from a light attack, that is, a level of nuclear attack substantially less than what would be expected in a major nuclear exchange. The United States started to deploy a light area defense, the Sentinel system, in the 1960s. In 1968, Sentinel's name was changed to Safeguard, its mission was changed to protecting Minuteman ICBMs, and its light area defense role was markedly reduced. After the ABM treaty was signed, the few sites that had been built were dismantled. Studies of light area defenses continued, however, on the assumption that the United States would eventually need them. One rationale was that we needed to raise the threshold of any small nuclear attacks made on us by the Soviets. It cannot be denied that as the commitment of weapons required by an attacker increases, and the intensity of probable responses therefore becomes larger, the likelihood of his engaging in impulsive acts declines dramatically. It was further argued that the whole country needs protection—with increasing urgency as nuclear weapons proliferate—from attacks by nations with small nuclear arsenals, from accidental or unauthorized attacks by any source, and from attacks by terrorist groups. Supporters of light area defense reason that although such attacks may be unlikely, there is a finite probability that one or more will eventually occur.

Until recently, light area defenses had to rely on strings of radars along the coasts, as ground-based radars could not survey beyond the horizon. Short-range surveillance begat numerous (and expensive) short-range missile sites. Several developments since the early 1970s have altered that situation. Air- and space-based surveillance of huge areas is now feasible. Small, accurate, hypervelocity BMD warheads are practical, making the interceptors that carry them much faster given the same overall weight. The huge signal and data processing requirements of a central site can probably be accommodated now because of vast improvements in computers. Space-based directed-energy weapons could provide light area protection even if they could not achieve whole-country ballistic missile defense.

Light area defenses would also have growth potential as the threat became more sophisticated or the potential number of attacking warheads increased; more interceptors could simply be added. The

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

sensors and computers are the key components for upgrading; they need higher capacities and improved software to solve the complex problem of finding warheads among a variety of penetration aids. As this upgrading is achieved, the light area defense could gradually become the terminal portion of a whole-country defense.

An upgraded light area defense system deployed overseas might also provide a dense defense against attacks on NATO by Soviet theater nuclear forces. Our European friends might be comforted by the realization that the United States would no longer be constrained in its diplomatic support by the concern that the Soviets might engage in nuclear adventurism against Europe as a response. If the Soviets also deployed a defense, it might neutralize the retaliatory forces of both Great Britain and France, but both could field sophisticated penetration aids that would add to the Soviet Union's uncertainties about its defense effectiveness. Of course, with the nuclear threshold raised on both sides by the presence of defenses, NATO readiness at the conventional level would become even more important than it is now.[5]

While effective light area defenses would require modification of the ABM treaty if we decided to deploy them, they seem to violate none of the precepts of strategic arms-control theory. They would simply force the Soviets to increase the scale and risk of a successful nuclear attack, thereby deterring an attack and increasing stability. Small numbers of interceptors would not significantly undermine assured destruction. They would not increase the level of nuclear weapons in the world. Even if they drove the Soviets to counter with an increase in offensive weapons, that increase would presumably be nullified by the number of weapons that would be intercepted and rendered useless. The world should be a somewhat safer place with light area defenses, particularly since they could evolve to meet an increasing threat.

In the cases of hard-point and local area defenses, it was noted that alternatives to defense could be used to achieve the same objectives, sometimes at lower costs. There are no alternatives, though, to light area defense, so we must think quite differently about the costs involved. Cost comparisons must be tied to the damage that expenditures on light area defense could prevent, including the loss of human life. Tens of thousands of human deaths and billions of dollars of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

property damage would be a tragic price to pay when they could be avoided by deploying an efficient light area defense.

One point should not be forgotten, however: none of these hard-point, local area, or light area defenses against ballistic missiles can provide effective protection unless augmented by air defenses against bombers and cruise missiles. Although BMD systems have substantial capability against airborne threats, they are insufficient. Air defense would also be required for whole-country BMD systems.

WHOLE-COUNTRY DEFENSE

Whole-country defense is the subject of greatest contention in discussions of ballistic missile defense. President Reagan's March 1983 speech set the protection of all Americans from the threat of all nuclear weapons as the ultimate goal. The Fletcher panel also focused on defense-in-depth of the whole nation as the heart of its study, acknowledging lesser deployments as potentially useful components of the whole.

When ICBMs first appeared in 1957, whole-country defense was an immediate concern. But in the following decade, the outlook for a successful city defense became bleaker. When a 1968 Defense Department study showed that even a very expensive city defense system would not reduce the casualties sustained in a heavy attack, the major funding for city defense R&D was cut back and substantial funds were diverted to hard-point defense.

What were the technical deficiencies that spelled the demise of city defense? Boost-phase defenses had been examined in the early 1960s and found impractical—surveillance requirements could not be met with existing technology, and interceptor velocities (even from a space platform) were too slow to allow a sensible system design. The effectiveness of penetration aids in space, where the drag of the atmosphere is not a factor, made an effective mid-course defense unlikely. Although atmospheric drag would separate warheads from decoys during the terminal phase, the altitudes at which this occurred were too low for city defense. And the capacities of computers required to handle an intense attack were far beyond the state of the art.

But if whole-country defense was laid to rest in the late 1960s, why resurrect it now? Technological advancements have occurred that

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

promise order-of-magnitude improvements in every area previously deficient. Multi-spectral infrared sensor technology allows surveillance of the whole earth from deep in space; computer processing capacity has increased a thousandfold. The most exciting new technologies are speed-of-light weapons, which could substitute for slower interceptors and make space-based boost-phase intercept feasible. Regardless of current criticisms, such weapons might prove cost-effective. After all, the chemical energy equivalent of ten kilograms of fuel would be sufficient to kill a hardened Soviet missile weighing hundreds of thousands of kilograms. Furthermore, protection and survivability of space platforms can in principle be enhanced, so there is some prospect that they can win a long-term offense-defense competition.

There are still a good number of problems to be addressed. Intercepts occurring earlier in the ICBM's trajectory (as early as the boost-phase, in fact) must cope with a panoply of penetration aids, and it is important to determine whether new technologies will meet that requirement. It is also important to assess whether the systems that emerge will be lethal enough to perform the mission, and robust enough to survive a massive effort by the Soviets to nullify or counter them.

POSSIBLE SOVIET ACTIONS AND REACTIONS

The Soviets will doubtless regard the various tiers of a BMD system differently, reacting more strongly to space-based weapons systems than to the more familiar terminal or mid-course systems. How, then, might the Soviets respond to our deployment of a broad-coverage, terminal/mid-course ballistic missile defense that contained airborne and space-based sensors, but no space-based weapons?

First, the Soviets would have to assess the overall current and potential effectiveness of our defense and build up their offensive forces accordingly. In order to attack those targets they believe are critical, they would have to take into account that our defense can range over a large area, and they would therefore have to use large multiples of the actual number of targets. In a democracy, preferential defense of regions is obviously inappropriate. Yet if an attack occurs, our defenses, although deployed for broad protection, must surely first be employed to protect those sites critical to our survival

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

as a nation. The worst aspect for the Soviets will be uncertainty; not knowing which targets we are determined to save, they cannot be confident that their attack will succeed. To counter the obstacles posed to a successful preemptive strike by the survivability of our retaliatory forces and the existence of our defenses, the Soviets will be driven to building defenses of their own. To be uncertain of their capabilities against us, while certain that we could annihilate them should be intolerable for the Soviets.

The result would be a world in which both superpowers have deployed offensive *and* defensive strategic systems. Would such a situation merely reestablish, but at a greater cost to both sides, the status quo?[6] The answer is no, because of two new, key factors. Defenses will have raised the threshold for effective attacks so high that only major nuclear strikes would have an effect, and the uncertainty of outcomes would be great. Thus, the likelihood of a nuclear exchange would be substantially reduced, the spectrum of conditions under which it might occur greatly narrowed, and both sides would have means of protection against accidental launches and third party attacks.

The Soviets may react more vigorously to a U.S. defense system if it is deployed in space. Since space-based weapons have to be deployed gradually, on orbital paths the Soviets can readily predict, we should expect that the Soviets, fully aware of the threat such weapons pose, would make every effort to destroy them. The Soviets may calculate that speed-of-light weapons in space would grant global hegemony to the first country that deploys them successfully. They may reason that once either side gets a space-based system in place, its survivability may depend on preventing the other side from undertaking unauthorized launches into space. They might also reason that even if *both* sides deployed space defenses, the co-presence in space of Soviet and U.S. directed energy weapons of approximately equal capability might be extremely destabilizing, as an attack by either side on the other's defense could grant a country global hegemony in a matter of minutes. Motivated by such fears, the Soviets may consider attacking our defense satellites and launch pads.

Accommodating such extreme possibilities would require heroic measures. Our launch sites might be hardened against all but nuclear attacks, they might be defended, or their security might be part of a negotiated arrangement with the Soviets covering defenses. As for

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

security in orbit, defensive satellites (DSATs) could be launched into orbit with each directed energy battle station.

Because of its obvious expense and complexity, a space-based defense will probably not be deployed unless it is a low-leakage system. How would such BMD further affect the strategic balance set by terminal/mid-course defenses? First, it would remove us from the era of deterrence by mutual assured destruction. An all-out Soviet attack may still wreak havoc on our country, but it could not annihilate us. Second, it would place increased demands on the Soviet defense system, which would be driven to achieve balance with our own. Our inability to destroy each other would establish a new deterrence, one based not on the terror of offensive forces, but on respect for defensive systems. This situation has been characterized by some as a move from assured vulnerability to assured survivability. This is not exactly the case, since no imaginable set of defenses can prevent a determined and resourceful enemy from detonating nuclear weapons in our country. But the attacker's certainty that his objectives (other than naked terrorism) cannot be achieved, provides a quantum change in strategic perspective.

How does whole-country defense fit in with strategic arms-control theory? It would certainly be consistent with important goals of arms control. It would improve stability by raising the nuclear threshold and introducing a greater measure of uncertainty into an attacker's plan. There are those who disagree with this: they argue that defense is *de*stabilizing because deployment of defenses may alarm the other side by signaling a changing strategic balance, thereby encouraging a preemptive nuclear attack; and that defenses, known to be imperfect, will only be used by the *attacker*—against his opponent's ragged response to a massive first strike. The first of these objections would be sound only if there existed a huge imbalance in superpower forces—which is not at all the case today. The second objection would be valid only if it were the case that reducing the number of attacking warheads would allow poor defenses to become nearly perfect. But a defense of acknowledged mediocrity can be penetrated in a variety of ways by forces whose survival from an all-out first strike can be assured. A ragged retaliatory strike, therefore, is inexcusable militarily; neither side should allow the balance or the quality of offensive forces to become so degraded.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Arms control would still have an important role in a world of whole-country defenses. Even though the defense systems may themselves be non-nuclear, the total number of nuclear weapons in the world would be increased if the Soviets responded to our defense deployments (or we respond to theirs) by deploying a larger number of offensive forces. Moreover, in the absence of mutual restraints, either country may feel compelled to continue augmenting its offensive forces without limit, even if cost-exchange ratios favor defenses. That a truly massive effort in offensive deployment could overcome any defense is a certainty. Thus, even in a defense-oriented world, agreements on acceptable levels of offensive nuclear arms would be imperative.

Whole-country BMD does violate one of the precepts of current strategic arms-control theory: it renders retaliatory forces less effective. But a defense orientation would rely on a different form of deterrence: the would-be aggressor would be disuaded not by the fear of annihilation so much as by the recognition of futility. Particularly if the cost-exchange ratios favor defense, the motivation would be to negotiate. In the end, the level of nuclear weapons required by the superpowers should become just sufficient so as to maintain an adequate margin over any combination of forces of lesser nuclear powers.

NEAR-TERM COST ESTIMATES

The last question to ask about the move toward a BMD-oriented world might be whether the amount of money earmarked for the president's Strategic Defense Initiative is too much. The plan was to spend about $26 billion over the first five years (1984–89), then to decide in the early 1990s which technologies are suitable for incorporation into systems. This would give future administrations the option to proceed with engineering development of those technologies and to deploy them—if feasible—in the first decade of the twenty-first century. Some technologies, and therefore some systems, can be ready for engineering development (building of prototypes) before 1993 and deployment before 2000. But the $26 billion SDI estimate includes no full-scale engineering development for these systems, and does not provide funds beyond 1989.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Estimated expenditures for the SDI through the 1980s average around $5 billion per year. Historically, the Pentagon has allotted about 10 percent of its budget to research and development of all kinds. The current amount is about $30 billion per year. By 1989, the SDI will require about 17 percent of the Pentagon's R&D budget—not insignificant, but certainly affordable. Government officials have estimated that $15 to $20 billion of the projected $26 billion would have been spent anyway in research and development on projects that are technologically similar to potential defense systems, on work to prevent technological surprise, or on efforts to keep penetration-aids technology at the state of the art.[7] The whole SDI budget will amount to far less than what Americans will spend on cigarettes or cosmetics during the same period.

The costs of possible future systems development can only be guessed at. Major systems such as submarine-launched ballistic missiles and bombers cost several billion of today's dollars to develop. A complete BMD system might consist of as many as ten separate systems, costing perhaps $40 billion for full engineering development. Estimates of the full-scale engineering development costs, like the ultimate systems costs, should be given little attention and still less credence now, especially since they seem to be within the broad bounds of affordability.

In considering these costs, we need to take a broader view than is usual in the formulation of public policy. Both the promise and the problems of the new defense technologies being investigated in the SDI will require a long time to clarify. This urges us to seek a new perspective on our long-term strategic posture. Because we elect our politicians to terms of two, four, and six years, and make five-year guidance plans for the Defense Department, we find it hard to think in terms of the twenty-, fifty-, or one hundred-year future. But the challenge we face is a massive one: averting nuclear holocaust for centuries. Our ambitions to create an effective whole-country defense using futuristic weapons should be viewed in that light. And the costs of developing such a defense should be considered in those terms as well.

THE SDI AND ARMS CONTROL

Perhaps the most delicate issue raised by the SDI concerns the coordination of defense research with the development of a rational

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

strategy for strategic arms reductions. As I noted above, arms control will remain important even in a defense-oriented world. Therefore, we must not blunder into situations that would be disastrous to our prospects for strategic arms reductions. Neither do we wish to cling to tenets of arms control that are flawed or outdated. Each defense discussed above would require renegotiation of the ABM treaty before its deployment, and testing many of the components in the ABM mode might also require treaty modifications. Our existing treaties are the product of honest and diligent efforts, and reflect the views, ideals, and technologies of the time. Nevertheless, they should not be viewed as sacrosanct. These treaties were all originally devised for security purposes, and if those purposes can be shown to be better served in new ways, the treaties should be adapted to changing circumstances.

As I have argued above, there are a variety of defense systems beneficial to American security that appear consistent with arms-control goals implicitly endorsed by the Soviets in their signing of past agreements. In many instances, the Soviets came to accept arms-control measures they initially condemned—the ABM treaty is an excellent example of this change in Soviet posture. We should not be surprised if the Soviets react to the SDI in much the same way.

SUMMARY

I have argued that many new technologies show promise of making a spectrum of BMD systems practical; that a strategic posture based on defense can contribute to deterrence, increase stability, and reduce—and perhaps eventually eliminate—the threat of nuclear extermination; and that we ought to support a vigorous development of BMD technologies to discover their true potential.

In saying these new technologies show promise, I am not assuming, or offering a guarantee of, success. The Fletcher panel concluded only that the technologies were sufficiently understood for us to sketch out broad systems concepts for a multilayered defense. The crucial technological issues will take years of research, engineering, and analysis to resolve; they certainly cannot be resolved now by polemics. Yet in our open society, any large and technically ambitious initiative like the SDI is subject to immediate and widespread attention from the media and the citizenry. Temptations are irresistible for

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

intellectuals, who deal in words rather than hardware, to attack broad system concepts as if they were actual system designs, and to predict confidently the outcome of decades of research. Any broad-based technology program such as the Strategic Defense Initiative must be guided by a set of conceptual systems that is admittedly incomplete and imperfect. Unless the public is discriminating, it may find itself unable to distinguish issues from quibbles in the debates over the direction of the SDI. Thus, the seeds of good ideas may be lost before any facts can be determined. For now, the question should not be whether conceptual systems will work, but whether the technology is worth pursuing to find out what can be achieved: let us stick to that question.

ENDNOTES

[1]Gen. Russell E. Dougherty, "Capability × Will = Deterrence," *Air Force Magazine*, June 1984, pp. 7–8.

[2]Texts of the Fletcher and Hoffman reports, as well as the Defense Secretary's summary report, can be found in "Strategic Defense and Anti-Satellite Weapons," Senate Committee on Foreign Relations, 98th Cong., 2nd sess., April 25, 1984, pp. 94–175.

[3]One such tactic is shoot-look-shoot, in which the attacker fires a first wave of missiles, watches to see which sites are defended successfully, and then fires a second wave concentrated on those targets. In the time required for shoot-look-shoot, however, the defender may retaliate with his surviving forces.

[4]See Harold Brown, *Thinking About National Security: Defense and Foreign Policy in a Dangerous World* (Boulder, Colo.: Westview Press, 1983), p. 71. Brown describes the concept of preferential defense for ICBMs, but notes that unless the ICBMs are deployed in deceptive basing, adding ballistic missile defenses will not have a significant effect on ICBM vulnerability.

[5]Colin S. Gray, *Nuclear Strategy and Strategic Planning* (Philadelphia: Foreign Policy Research Institute, 1984), pp. 86–92, provides a point-by-point discussion of the effects that BMD might have on the NATO alliance.

[6]In the late 1960s, when the United States first considered deploying a ballistic missile defense, Secretary of Defense Robert McNamara argued, for instance, that "all we would accomplish by deploying ABM systems against one another would be to increase greatly our respective defense expenditures without any gain in real security for either side." *Department of Defense Annual Report, FY 1968* (Washington, D.C.: Government Printing Office, 1967), p. 40.

[7]"SDI Hearings Focus on Financial Aspects," *Aerospace Daily*, May 10, 1984, pp. 57–58.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

George Rathjens and Jack Ruina

BMD and Strategic Instability

In his "Star Wars" speech of March 23, 1983, in which he launched the Strategic Defense Initiative (SDI), President Reagan called for an effort to develop a defense against ballistic missiles which would change the basis of national security policy in a fundamental way. Instead of relying on the threat of punitive damage as a means of deterring the use of nuclear weapons against the United States and its allies, the SDI aims at preventing their delivery, through the development and deployment of active defenses. In calling for a defense that would render nuclear weapons "impotent and obsolete," the president was wittingly or unwittingly implying not only a 100-percent effective defense against ballistic missiles, but complementary and equally effective defenses against all other means of delivery of nuclear weapons as well—a point that was subsequently made explicit by Secretary of Defense Caspar Weinberger.

President Reagan's goal of a perfect defense stirred the interest of the general public and of many public figures who have long sought an alternative to deterrence based on mutual assured destruction (MAD). Yet MAD is not a policy capable of being changed by political will; it is rather the inevitable consequence of the superpowers having the nuclear arsenals they have. Recalling the Manhattan and Apollo projects, which overcame seemingly difficult technological problems, many argue in support of the president's initiative. They do so, however, not fully appreciating the difference between the SDI and these two earlier efforts, i.e., that the SDI involves competing against a determined and resourceful adversary *as well* as unlocking nature's secrets and harnessing technology.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

A substantial amount of support for the SDI has also developed within the community of military technologists and strategists. This has occurred less from a belief that a perfect defense against nuclear weapons can be realized than from a general interest in defense missions far less demanding than that proposed by the president. The tension between the president's goal of a perfect defense and many of his supporters' more modest goals of limited defenses was reflected in the presidential study groups (especially the Fletcher and Hoffman panels) that were formed after the president's speech, as well as in the administration's January 1985 special SDI report.

More limited roles for BMD include those that were considered when BMD was a major national issue in the 1960s: minimizing damage in the event of an all-out ballistic missile attack; defense of hardened military installations such as ICBM silos and command-and-control facilities; defense against unauthorized or accidental attack; and defense against lesser nuclear powers. Additional justifications for BMD in the 1980s include limiting the possibility of a Soviet "light" attack with nuclear weapons, and inducing the Soviets to reduce their commitment to land-based missiles (now their dominant nuclear force) in favor of other systems such as submarine-launched missiles (SLBMs), which to some seem less worrisome.

The counter-arguments to these more modest goals are also similar to those invoked in the past. The first argument is that BMD technology is not up to some of the tasks being considered. The second is that these objectives, if they need be met at all, can be better realized through means other than active defense. The third is that in reaction to U.S. BMD deployment, the Soviets will not only increase the size and capability of their offensive nuclear forces but will also develop and deploy a BMD system of their own that we must assume will be about as effective as ours. The result of this competition could be a net loss in the security of both countries. The fourth argument seeks to counter the claim that deploying a BMD of even limited capabilities would provide valuable operational experience for subsequent deployment of a system intended for population defense. Whatever fears a country might have about its adversary's "break-out" capability (rapid deployment of an operational system) would certainly be exacerbated by its development, training, production, and testing of a limited but operational BMD.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Concerns about deployment aside, the prospect of a greatly expanded SDI R&D program is troublesome. First, it will likely increase incentives for each side to improve its offense because of the enormous uncertainty in estimating the effectiveness of defenses during the R&D phase, and because of the inherent conservatism that leads military planners to base their R&D and procurement on worst-case analyses. In addition, the effect of the SDI program, and similar Soviet efforts, will be to undermine U.S.-Soviet arms-control negotiations, as neither side will be willing to make deep cuts in its offensive forces if work on strategic defenses is intensified. The reality of mutual assured destruction may be unsettling, but neither country is likely to give up, or even significantly reduce, its offensive retaliatory capability in the face of possible defensive deployments by the other. Indeed, the history of the nuclear weapons competition between the U.S. and the Soviet Union demonstrates that each country will do whatever it feels is necessary to maintain this capability for deterring nuclear attack.

We therefore see serious harm resulting from the current SDI program and similar Soviet BMD efforts. This includes:

1) an increase in U.S.-Soviet tensions and intensification of the arms race;

2) the possibility that one of the superpowers would withdraw from the ABM treaty and deploy some type of BMD, even one of doubtful effectiveness;

3) erosion of the confidence of our European allies who are deeply troubled by the implications an SDI program and possible BMD deployment might pose for their security;

4) a false sense that technology and new weapons systems can eliminate the threat of nuclear destruction.

We want to emphasize that we find the pursuit of strategic defenses worrisome for these reasons, and not—as some maintain—because of concern over *crisis instability*. In our view, fears that deployment of a (purportedly) effective population defense could lead to substantially increased risk-taking during a crisis, or possibly even to a preemptive first strike, on the grounds that such a defense would be more effective against a degraded retaliatory force, are unwarranted.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The very possibility of such a defense, and its consequences for crisis instability, can be almost totally discounted given the offense-dominant nature of nuclear weapons, and the technical realities facing strategic defenses.

Nevertheless, we shall treat the possibilities of *perfect* and also *very good* defenses analytically. We are paying more attention than we believe is warranted on technical and cost-effectiveness grounds simply because it is the promise of an effective shield against nuclear weapons that has captured the imagination and hopes of the president and the American public. We will also discuss more realistic defense possibilities, including two special cases: defense of selected military assets, particularly strategic forces; and defense against unauthorized, accidental, or third country attack.

COST-EXCHANGE RATIOS

One important consideration in judging the merits of any type of defensive system is the cost-exchange ratio involved, that is, the incremental cost to the offense to ensure the ability of its warheads to reach their targets, compared to the added cost to the defense to intercept those warheads.

As an illustration, consider whether it would make sense for the U.S. to invest in defense of its industry and population from nuclear attack using technology presently available. We can hypothesize a variety of defensive measures, including air defense, civil defense, and different BMD deployment schemes, that might save a million lives in the event of a nuclear attack, and then estimate the minimum cost to the Soviet Union of upgrading its offensive capabilities just enough to negate each of these hypothetical American investments.

If the Soviet Union could negate such defensive measures at a cost much lower than the incremental American investment in defense, then U.S. investment in defense would likely be of little use. Assuming the Soviet Union wanted to maintain its current ability to inflict damage on the U.S., it would presumably make whatever investment would be required to offset ours. If we, on the other hand, could develop a defense system that could be negated only by relatively costly Soviet improvements, investment by the U.S. in defense would seem desirable. In this case, the Soviet Union presumably would not

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

react, because any improvement in its offensive capabilities could be negated by a much smaller American investment in defense.

There is a third possibility. If the cost-exchange ratio for the best defense option we could identify were near unity—if the marginal costs to the offense and defense were about equal—then deciding whether to implement the defense option would be more difficult. Would the Soviets be less or more determined to threaten additional destruction than we would be to negate that possibility? If both nations were to attach the same weight to that increment of destruction, could the U.S., with its stronger economy, more easily afford to reduce the expected damage than the Soviet Union could afford to offset that reduction?

In any event, estimates of cost-exchange ratios are of limited value since they generally reflect the likelihood that each country overestimates the effectiveness of the adversary's weapons programs, while underestimating his own. Nonetheless, ratios either highly favorable to the offense or highly favorable to the defense do indicate, respectively, offense and defense dominance. A ratio near unity may well imply a vigorous offense/defense arms race, with each side straining to offset the improvements made by the other.

It should be remembered that calculations of cost-exchange ratios will necessarily be highly tentative in the absence of concrete formulations about what the defense will look like. It is true, however, that the more nearly "perfect" a defense strives to be, the more likely it is that additional investments will be relatively unattractive. The reason for this is the adversary's option of *preferential offense targeting*. An attacker can selectively choose which targets to attack, and concentrate its forces on them, while the defender must be prepared to defend all targets against such efforts. This challenge is especially acute when the defense is seeking to protect cities and population.

On the other hand, a limited defense that seeks to protect a fraction of its targets may benefit from *preferential defense*. The defender can concentrate his defenses to protect a fraction of his targets, but the attacker, not knowing which targets are to be defended, will be driven to expend more weapons than needed against undefended targets if he is to have much hope of destroying defended ones. Such limited defense is likely to be of use particularly in assuring the survival of retaliatory capabilities. Even if the defender is left with

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

only 20 percent of his one thousand ICBMs, that would constitute a potent retaliatory force.

The cost-exchange ratio will, of course, depend sensitively on the technological options available to the two sides, and it is conceivable that it could change dramatically if new options become available. The current interest of the SDI in boost-phase defense illustrates this point. One of its great conceptual attractions as a "perfect" or highly effective defense—as opposed to the terminal defenses of the 1960s—is that it avoids the problem of offensive preferential targeting: each increment in defense capability provides the same degree of added protection to all targets. However, as we will elaborate below, whether concentrating on boost-phase defense can *in fact* yield a favorable cost-exchange ratio for the defense is very doubtful given the many technical challenges involved, the relative ease of countering a boost-phase defensive system, and the difficulty of protecting a space-based BMD system against direct attack.

PERFECT DEFENSE

There is something unprecedented about a defense that would make nuclear weapons "impotent and obsolete": it *really would* have to be perfect, not just very good. Non-nuclear offensive systems have been "rendered impotent and obsolete" by defenses that were less than perfect (armored knights by archers and the musket, for example), but the challenge is much more difficult when the issue is defense against nuclear weapons, with their individual destructive power.

In non-nuclear combat, the survival of some percentage of the loser's military forces has rarely been militarily or politically important. But with defense against nuclear weapons there is a world of difference between 100 and even 99 percent effectiveness. The former would, indeed, make nuclear weapons "impotent and obsolete," except perhaps for coercive purposes against nations not having defenses. A defense that is 99 percent effective would, on the other hand, result in unacceptable leakage in a war between the superpowers. The detonation of even as few as five or ten Soviet warheads (less than one-tenth of one percent of the Soviet arsenal) on U.S. cities would cause unparalleled destruction, something McGeorge Bundy has rightly characterized as "a disaster beyond history."[1]

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

To relieve all public concern about nuclear weapons, to assure political leaders that a defensive system would eliminate the possibility of a nuclear explosion on their own or allied territory, and to convince one's adversaries that nuclear weapons would not be at all useful to them—and "impotent and obsolete" would have to entail all these things—a defense would have to be virtually 100 percent effective, and perceived as such by both sides. This means that the system would have to perform flawlessly the very first time it is called upon, that it be invulnerable to direct attack, and that it be effective against *all* means of nuclear weapons delivery, including aircraft and cruise missiles as well as ballistic missiles.

In summary, we do not believe perfect defense to be a realistic possibility, particularly if the Soviet Union reacts by improving its offensive capabilities, as the Hoffman panel has recognized is likely[2] (but as the manager of the SDI program does not).[3]

VERY GOOD—BUT LESS THAN PERFECT—DEFENSE

It is our conviction that even a very good defense is not a possibility, assuming one is dealing with a determined adversary with substantial resources at his disposal. By "very good," we mean a defense capable of affecting the behavior of nations in times of crisis. Defenses that would be 99 percent or more effective against a "first strike" would meet this criterion. Such defenses might well affect decisions by political leaders in the event of crises in the Middle East, the Persian Gulf, or Europe. If one or both superpowers were confident that it could reduce the number of attacking warheads to a small number, say ten or less, then the U.S. and/or Soviet Union would presumably be willing to take larger risks in escalating a conflict. This might be the case even if it posited a somewhat poorer defense performance, e.g., if it faced the possibility of ten to fifty warheads leaking through. We would be doubtful, though, about its taking such risks if the expected leakage exceeded a hundred. This suggests that in order to be of political-military worth, defenses would have to be effective at the 99 percent-plus level.

Such defenses would have a terribly—and we use this adverb literally—troublesome effect on crisis instability. However effective defenses in this range might be against an adversary's "first strike," they would be still more effective against a ragged retaliatory force.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Expected leakage could be sufficiently reduced to justify political/military decisions that would be judged unacceptable in the absence of defense. If technology and cost-effectiveness considerations warranted such defenses, a country might proceed with their development and deployment on the assumption that a situation might develop in which it would be willing to launch a first strike; once a defense system is deployed, the incentive to strike first in a crisis situation could be overwhelming. If an opponent's defenses were vulnerable, the attractiveness of preemption would increase. Country A might strike first at B's defenses, so degrading them that a significant number of A's warheads might then be delivered against B's offensive force, reducing it to the point where A's defenses could reduce the leakage from a retaliatory attack by B to "acceptable" levels. This creates quite an incentive, and a reciprocally reinforcing one, for both sides to strike first during a crisis.

We feel it necessary to stress again that, in our view, this type of very good defense is illusory, at least as it applies to confrontation between the superpowers. The ongoing competition between defensive developments on the one hand, and offensive countermeasures and defense suppression techniques on the other, will mean that even if some BMD systems are deployed, the goal of a perfect, or even very good, defense will be unattainable. For this reason, longer-term considerations of crisis instability should be of little real concern.

Concerns about arms-race instability, on the other hand, are indeed justified, inasmuch as arms races seem to be driven as much—or even more—by fear of what *might* happen as by what is likely. If there were even a remote prospect that either superpower, or both, could deploy defenses that would be 99 percent effective, there would be enormous pressure for the would-be defender to improve the figure and for its adversary to reduce it. From an arms-race perspective, it is difficult to imagine a prospect more destabilizing.

FAIR-TO-GOOD DEFENSES

Few advocates of the SDI, with the possible exception of President Reagan and Defense Secretary Weinberger, believe that perfect or very good defense, as we have used the term, is realizable. Some, however, do envisage the possibility of such dramatic improvements in defenses that the cost-exchange ratio may approach unity at, say,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

a 50-percent effectiveness level. That is, they envisage an offense-defense technological balance that would permit, if not lead to, the deployment of defenses and offensive forces such that the expected level of damage in the event of conflict would be around 50 percent, or anywhere in the range of 1–90 percent (our arguments are invariant over this range). Efforts to decrease the damage level to below 50 percent through additional increments of defense could be offset by incremental improvements in offenses at less cost, while efforts by the offense to increase the level of destruction beyond 50 percent could be negated less expensively by incremental improvements in defense.

Were technological developments to permit such defenses, we would expect to see strong interest in deployment, for if the cost-exchange ratio were unity at the 50 percent destruction level, it would surely be much more favorable to the defense at higher levels of expected destruction. Each side would presumably have an impetus to deploy defenses sufficient to hold damage to some level of destruction, perhaps 70 percent, that would clearly be cost effective, while its adversary would not be strongly inclined to try to increase it beyond that level. This would follow given the unfavorable cost-exchange ratio to the offense and the fact that it would gain little, if any, political-military utility from increments in prospective damage level in this range.

In such circumstances, one would expect a continuing technological competition that might shift the balance one way or the other. From the perspective of crisis stability, however, the situation would be much less worrisome than if the cost-exchange ratio were unity at a level characterizing very good defenses—such as 99.9 percent—where small changes in capabilities would be politically and militarily exploitable, and where there would likely be enormous advantage in launching a "first strike."

OFFENSE DOMINANCE

We now turn to the current situation, in which the offense is dominant over virtually the whole range of destruction levels. This condition has obtained throughout the nuclear era, and is likely to persist between the superpowers for the indefinite future. As long as it does, we can be reasonably sure that the superpowers will invest the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

resources necessary to overcome each other's defenses. Since the 1950s, for example, the Soviets have spent billions of dollars upgrading their extensive air defense systems, yet the U.S. has continued its efforts to be able to penetrate them. Over the last decade, the U.S. has spent billions of dollars to modernize the B-52 bomber and equip it with short-range attack missiles and later with cruise missiles, to procure the advanced B-1 bomber, and to develop Stealth techniques that would allow U.S. bombers in the 1990s to evade radar detection and reach targets in the USSR. What makes this example particularly compelling is that, for both the U.S. and USSR, manned bombers are far less important for retaliatory deterrence than either ICBMs or SLBMs, yet the competition has continued. And, of course, there has been competition between ICBMs and ABMs, even though technology and cost-exchange considerations have always militated against large-scale defensive deployment, at least of a sort intended to protect cities and industry. ICBM penetration aids were developed in anticipation of the possibility of defenses being deployed, and the prospect of ABM deployments was also a—if not the—factor in the impetus to develop and deploy multiple warheads (MIRVs). Thus, almost every effort by one superpower to improve its defense capabilities can be expected to provoke improvement in its adversary's offense capabilities for as long as defensive developments do not significantly alter the current offense-dominated situation.

DEFENSE OF SELECTED MILITARY ASSETS

Up to now, we have been addressing defense of cities and populations, a fundamentally difficult problem, given the enormous destructive capability of nuclear weapons, the vulnerability of these targets, and the fact that loss of even a small fraction of them would be catastrophic. Defense of selected military targets, however (ICBM silos are usually cited), is a much easier task. It is quite possible that, unlike defense of population and social infrastructure, cost-exchange considerations will favor this type of defense. There are two reasons for this.

We have already mentioned that preferential defense can give great leverage to the defense in any situation where the same components (interceptor missiles, aircraft, etc.) can be used to defend any of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

several targets *and* where the loss of a large fraction of the targets is tolerable.

Second, the defense of military targets is often easier because it is possible to protect them against the effects of nuclear attack by passive means such as "hardening" (something not possible for cities), which enables them to survive near-misses. This is particularly important since the firing of defensive interceptors can be delayed until late enough in a warhead's trajectory for the defense to discriminate between warheads likely to destroy a target unless intercepted and decoys and warheads likely to miss their targets, or warheads aimed at targets already destroyed.

But cost-exchange considerations are not the only ones that bear on the decision whether to deploy defenses. One must also decide if the targets are worth defending, and whether there is indeed a threat. Placing a monetary value on the loss of a city and its population is clearly a formidable—some might argue, impossible—task; it is clearly easier to make judgments about the worth of missile silos or other military targets. One should also raise the question whether there are alternatives to defense that could accomplish the same military mission, e.g., providing for the delivery of a desired level of retaliatory attack. When such comparisons are made—and this must involve not just dollar costs, but considerations of stability and other factors—it could be that retaliatory deterrence would be better served by buying larger numbers of offensive missiles or by placing greater reliance on mobile systems.

However, in the absence of a considerably increased Soviet threat, we would argue against either buying defenses to protect U.S. strategic forces or increasing offensive forces. We would argue this on the grounds that the so-called "window of vulnerability" has been much overrated. As President Reagan's Commission on Strategic Forces, chaired by General Brent Scowcroft, recognized, the enormous uncertainties over whether a Soviet attack on U.S. strategic forces would be successful, and the tremendous risk that such an attack could lead to general nuclear war, make the threat of such an attack implausible, at least in the near term.

As a final note, we should point out that it is possible to develop and deploy a respectable terminal BMD system for hardened military targets with state-of-the-art technology. The Department of Defense has pursued relevant technologies for hard-target defense since the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

signing of the ABM treaty in 1972. Yet it is not at all clear that the massive SDI program now underway can or will lead to the development of hard-site defense systems that are any more useful or cost effective than those that might emerge from the continued orderly pursuit of BMD technology as it existed prior to the SDI. The SDI program therefore seems irrelevant to decisions about whether to pursue hard-site defense deployment; indeed, it may even be diversionary.

DEFENSE AGAINST UNAUTHORIZED, ACCIDENTAL, OR THIRD COUNTRY ATTACK

The case against defense in general is not quite as strong as the foregoing suggests, for we have not dealt with the possible role of defense in coping with threats to either of the superpowers from unauthorized or accidental launches and nuclear attack by third countries. Because such defenses would not have to meet the same stringent technical, cost-effective, and survivability criteria as other BMD systems, they could well provide an effective hedge against limited attacks. For example, deployment of defenses may be attractive to the superpowers in dealing with a threat from a third party, as its limited resources could make it difficult for it to counter heavy investment in defenses by a superpower. It is conceivable that a superpower could deploy a defense that would be very effective against a third power, but relatively ineffective against its main adversary, because of the much greater initial offensive capability of the adversary superpower and because it would more likely improve its offensive capabilities to negate any increment in investment in defense.

If the Soviet Union deployed such a defense, against China for example, how ought the United States to react? From a narrow cost-benefit/game-theory perspective, it would only make sense for the U.S. to improve its offensive capabilities (and/or deploy defenses) if it seemed plausible that the Soviet initiative might lead to acquisition of a "very good" defense against the U.S. In the real world, however, the propensity for worst-case analysis and the pressures of domestic politics and international image-making would make a U.S. response likely, even if the Soviet defense in question seemed quite incapable of dealing with American offensive forces. As for possible

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

nuclear threats to the U.S. from Third World nations or terrorist groups, their nuclear weapons are more likely to be smuggled in by ship or plane than to be delivered by ballistic missiles.

A decision by either superpower to deploy defenses designed to protect against unauthorized or accidental launch of ballistic missiles could also provoke concern. A light, nationwide defense of the U.S. might not call into question Soviet retaliatory capabilities, even after a U.S. preemptive strike. Yet it would be provocative to the extent that it could conceivably be rapidly upgraded to a more robust defense capable of dealing with a ragged Soviet second strike.

At present, even though the ABM treaty places very strict limits on the deployment, testing, and procurement of BMD systems and components, many critics of the treaty claim that the Soviets, through a combination of legal loopholes and illegal activity, are striving for a breakout capability. If the treaty is amended to allow even limited nationwide defenses, fears about upgrade and breakout capabilities will become still more serious. Even if the ABM treaty could be modified to permit deployment of limited defenses, such deployment could prove counterproductive if the end result is increased arms-race instabilities and a new round of offensive and defensive competition. And withdrawal from the treaty for the purpose of deploying a limited, thin area defense is likely to have even more serious consequences for the arms race, since there would be no defined limits to how much defense could be deployed. Treaty withdrawal would also likely have very negative consequences for arms control generally, and for our relationship with the Soviet Union and our allies.

As we noted in the case of defense of hardened targets, a reasonable thin area defense intended to protect against some unauthorized, accidental, or third-country attacks can be developed with existing technology. With time, such systems can surely be improved, but we need not await breakthroughs in technology resulting from the SDI program to address realistically the question of the net benefits of such a defense and to decide whether it should be deployed.

POLITICAL EFFECTS OF THE SDI

We have argued that there is virtually no prospect of realizing President Reagan's objective of "rendering nuclear weapons impotent and obsolete," or of achieving even a very good defense of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

population and industry—at least if the threat is from the Soviet Union. This opinion seems to be shared by most of those involved in the SDI program. It is necessary, then, to ask: what is likely to come of the SDI, and should we be concerned about it?

In all likelihood, a superpower competition in strategic defenses will lead to an increased Soviet-American offensive arms race. We expect that U.S. defensive developments will lead to an acceleration of Soviet efforts both to develop similar capabilities for defense and to improve offensive capabilities, and we can expect corresponding U.S. reactions to Soviet efforts. If this process continues for some time—and clearly, the SDI has a very distant time horizon—pressures will develop for some kind of BMD deployment in both countries. Indeed, support is already developing in this country for a defense of ICBM silos and other military assets.

Here, perhaps, the American experience of the late 1960s is relevant. After years of R&D, and confronted with the beginnings of a limited Soviet BMD deployment, President Johnson could not resist pressures to go ahead with *some* kind of BMD deployment. Since there was no possibility of deploying a system that could be very effective against a massive, determined Soviet attack, a decision was made to deploy a system (Sentinel) that might cope with a much more limited attack, e.g., missiles launched by accident or by China. The system's objective and mode of deployment were later changed (as was the name, to Safeguard) to emphasize defense of Minuteman missiles. Something like this could well happen again, perhaps driven more by domestic political and institutional considerations—as was the case with the Sentinel and Safeguard—than by military arguments. Such a situation could further accelerate the arms race, particularly if the system in question even *appeared* to have the potential for upgrading to a nationwide defense of some effectiveness.

In this context, a greatly accelerated U.S. R&D effort on strategic defenses might introduce an insurmountable obstacle to arms-control negotiations. As the Soviets have made clear, they will not be willing to accept reductions in offensive forces until strict limitations are placed on defense efforts. Yet the Reagan administration has been equally adamant that it does not consider the SDI to be a negotiable bargaining chip.

Moreover, the SDI poses a real threat to the ABM treaty, which is probably the most significant arms-control agreement of the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

post–World War II period. By introducing some measure of certainty into U.S. and Soviet military planning, the treaty has weakened a major justification for upgrading offensive capabilities and developing defenses. It is difficult to believe that any deployment of new defenses would be so limited as to fall within the constraints of the treaty. Indeed, we are more concerned that there will be great pressure—perhaps successful—to scrap or emasculate the treaty long *before* any new deployments are initiated. It is hard to see how the U.S. SDI program, or Soviet counterpart, could proceed to the point of advanced testing and development *without* violating the treaty's provisions.

This brings us to another concern about arms-control agreements. It is quite clear that the Reagan administration's commitment to the SDI has been a factor in its reluctance to pursue negotiations to limit or halt the development and deployment of anti-satellite (ASAT) capabilities. This is troubling, because some restraint, whether covered by formal agreement or not, could well be to the advantage of both superpowers. This is so because the development of BMD technology under the SDI is likely to be very useful for ASAT purposes; this will work to the disadvantage of both superpowers, but particularly the U.S., given its dependence on military satellites.

The most worrisome aspect of the SDI may finally be its political-psychological consequences. Our concern focuses primarily on four groups: the general American public, American elites, the leadership of countries allied with the U.S., and the Soviet leadership.

The immediate response to President Reagan's March 23 speech and subsequent information derived from polls indicate a great deal of resonance with the president's vision. Americans want their children, if not themselves, to look forward to a world without the threat of nuclear weapons; they find appealing the notion of a defense so effective as to render nuclear weapons impotent and obsolete. We, however, see this vision as diversionary and illusory; it deludes the public into thinking that the solution to the dual problem of nuclear weapons and a troublesome adversary can be resolved by new weapons systems, rather than by political means.

As we mentioned earlier, most of those in the technical community, and many others who are well informed and concerned about security matters, share our belief that a perfect, or even a very good, defense against a massive Soviet attack against U.S. population

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

and industry is just not realizable. Yet, the president and his secretary of defense have continued to espouse the goal of a perfect defense not just against ballistic missiles, but against bombers and cruise missiles as well.

We are troubled that the SDI may raise special concerns in the case of Allied governments. They may well see the SDI and U.S.-Soviet competition in strategic defense as evidence of growing isolationism in the U.S., or as additional evidence that the U.S. is trying to deal with the Soviet problem mainly through military means, as opposed to political measures. There is also the fear that if limited American and Soviet defenses are deployed, both superpowers might be more willing to take increased risks in a crisis, which in turn could increase the vulnerability of Europe to a limited nuclear war. We discount this possibility, believing that there is no realistic prospect of defenses becoming that effective, nor even of their being perceived as that effective, but we cannot discount totally the impact of such beliefs in a time when actual deployment is a distant prospect. And there are those who hold that the prospect of a Soviet defense must call into question the effectiveness of British, French, and Chinese nuclear deterrents.

Finally, there is the Soviet reaction. The SDI must have raised questions in Moscow concerning the commitment of the U.S. government to the ABM treaty and current arms-control efforts. It must have reinforced the Soviet view that, despite the recent resumption of U.S.-Soviet arms-control talks, the Reagan administration is more interested in dealing with Soviet-American problems through military and technological competition than by political means. Indeed, because of Reagan's commitment to the SDI and statements by Secretary Weinberger to the effect that the ABM treaty should not stand in the way of strategic defense, the Soviet leadership must feel that the U.S. might trade off arms-control considerations in favor of military opportunities. In addition, there are probably at least some in the Kremlin who see the SDI as militarily threatening, as raising the possibility of first-strike capability.

In summary, we see virtually no chance of developing and deploying the perfect defenses that would be required to meet President Reagan's objective of "rendering nuclear weapons impotent and obsolete." We do not even see the possibility of deploying near-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

perfect ones. The president's public profession of his objective, as well as his and Secretary Weinberger's optimism about its realization, seem to us a triumph of wishful thinking and fantasy over reality: an act of surrender to the promise held out by technical fixes as the preferred means of dealing with nuclear arms and a difficult adversary—two situations that must ultimately be dealt with by political means.

The Strategic Defense Initiative stands out as the most bizarre episode in the sad history of the nuclear arms race. It is extraordinary that a U.S. president should include this theoretically laudable, but technically baseless, goal of negating nuclear weapons in his address to the nation; that he should continue to solicit support for the SDI as the centerpiece of U.S. strategic policy, both at home and abroad; that the community of ABM advocates has been reassembled and its goals legitimated; that technical experts who do not accept the unrealistic final goals of the SDI program have been able to include as intermediate goals a variety of partial defenses that require very different justifications from those put forth by the president; and that the suspension of good judgment has allowed the launch of an exploratory ABM program on a scale that is irreconcilable with both state-of-the-art technology and with reasonable pursuit of nuclear stability.

ENDNOTES

[1]McGeorge Bundy, "To Cap the Volcano," *Foreign Affairs*, Oct. 1969, p. 10.

[2]For an unclassified summary of the Future Security Strategy Study, directed by Dr. Fred S. Hoffman, see "Ballistic Missile Defenses and U.S. National Security," (Washington, D.C.: Department of Defense, Oct. 1983).

[3]According to Gen. James Abrahamson, "When they [the Russians] see that we have embarked on a long-term effort to achieve an extremely effective defense, supported by a strong national will, they will give up on deployment of more offensive missiles . . . ." *Science*, Aug. 10, 1984, p. 598.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

David Holloway

The Strategic Defense Initiative and the Soviet Union

ADVOCATES OF THE STRATEGIC DEFENSE INITIATIVE have pointed to the Manhattan Project and the Apollo program as examples of the marvelous feats that American technology can perform. But the SDI is a different kind of undertaking. The scientists and engineers who built the first atomic bomb and placed the first man on the moon did not have to contend with an opponent who was trying to foil their efforts. Those who wish to build a ballistic missile defense (BMD) system, however, have to take into account the fact that the opponent whose offensive missiles they wish to destroy will do everything he can to render the defense ineffective. None of the important questions that have been raised about the technical and operational feasibility of the SDI, or about its effect on U.S. security, the risk of nuclear war, and the prospects for arms control, can be answered without some consideration of the Soviet leaders' view of President Reagan's initiative and of their likely response to it.

DETERRENCE AND DEFENSE IN SOVIET POLICY

Strategic defense has occupied a key place in Soviet thinking about nuclear war. At first, BMD was viewed as a natural extension of air defense, and a contribution to warfighting capabilities. In the late 1960s, however, Soviet attitudes changed as the implications of BMD for the strategic relationship with the United States were reassessed.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Soviet work on BMD began in the late 1940s or early 1950s as an outgrowth of an intensive program to build air defenses. When Soviet military doctrine and strategy were revised under Khrushchev to take account of the impact of ballistic missiles and nuclear weapons on the conduct of war, BMD was assigned a key role. Marshal V.D. Sokolovskii's *Military Strategy,* which was the most important study of strategy published during that period, declared that "one of the cardinal problems for Soviet military strategy is the reliable defense of the rear from nuclear strikes."

Sokolovskii, who had been chief of the general staff from 1952 to 1960, acknowledged that "in contemporary conditions the means and methods of nuclear attack unquestionably prevail over the means and methods of defense against them."[1] Yet claims made by Soviet leaders in the early 1960s suggested that the Soviet Union had found a way of carrying out the mission of strategic defense. In 1961, the Soviet minister of defense claimed that the problem of destroying enemy missiles in flight had been resolved. And in 1962, Khrushchev asserted that the Soviet Union had developed an ABM missile that could "hit a fly in space."[2] In the early 1960s, the Soviet Union began to deploy a BMD system around Leningrad, but this was soon abandoned. Later in the decade, work began on a system around Moscow, and this is the only system in the world now deployed.

Soviet BMD policy in the early 1960s was rooted in an unwillingness to regard vulnerability to nuclear attack as an acceptable basis for Soviet security. A leading military theorist of the time expressed a widespread Soviet view that the creation of an effective anti-missile system allows a country to rely primarily on its own defense efforts, rather than on mutual deterrence, which is dependent "on the good will of the other side." In 1967, the Soviet premier, Aleksei Kosygin, in language similar to that used by President Reagan sixteen years later, told a press conference in London that "I think that a defensive system which prevents attack is not a cause of the arms race. . . . Perhaps an anti-missile system is more expensive than an offensive system; but its purpose is not to kill people but to save human lives."[3]

Soviet military strategy assigned BMD an important role in the conduct of war. According to Sokolovskii, the National Air Defense Forces (which have responsibility for BMD) would have the primary role in protecting the country from nuclear strikes and in repelling the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

enemy's nuclear attack. BMD would minimize losses resulting from a nuclear strike, preserve the viability of the country's rear, and extend the combat capability of the armed forces. The main function of BMD in war, in short, was to enable the state and the armed forces to continue to function.

In 1967 and 1968, as the Soviet leaders were preparing for the SALT negotiations, there were signs of a change in their thinking about BMD. There seemed to be disagreement in the high command about BMD's effectiveness. The commander-in-chief of the National Air Defense Forces claimed that defenses could "reliably protect the territory of the country against ballistic missile attack." The commander-in-chief of the Strategic Rocket Forces, however, asserted that ballistic missiles had characteristics that, in practice, guaranteed their invulnerability in flight, "especially when employed in mass." More direct evidence of Soviet doubts came to light when work on the Moscow system slowed down in 1967 and 1968; only four of the eight complexes then under construction were completed.[4]

Alongside the growing doubts about the technical effectiveness of BMD came an increasing confidence in the deterrent power of the Soviet Union's offensive strategic forces, which were now approaching parity with those of the United States. In 1973, Maj. Gen. M. Cherednichenko, one of Marshal Sokolovskii's closest collaborators, wrote in the classified general staff journal *Military Thought* that the Soviet Union had now

> acquired the capability of delivering a devastating nuclear response to an aggressor in any and all circumstances, even under conditions of a sneak nuclear attack, and of inflicting on the aggressor a critical level of damage. An unusual situation developed: an aggressor who would initiate a nuclear war would irrevocably be subjected to a devastating return nuclear strike by the other side. It proved unrealistic for an aggressor to count on victory in such a war, in view of the enormous risk for the aggressor's own continued existence.[5]

Marshal N.V. Ogarkov, the former chief of the general staff, has written that in the early 1960s the United States could count "to some extent" on the possibility of a disarming strike against the Soviet Union.[6] But by the late 1960s, the United States, in the Soviet view, could no longer do so.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The Soviet leaders acknowledged that each side was vulnerable to a devastating retaliatory strike if it attacked first. The opening Soviet statement at SALT in November 1969 declared that

> mountains of weapons were growing, yet security was not improving but diminishing as a result. A situation of mutual deterrence existed. Even in the event that one of the sides was the first to be subjected to attack, it would undoubtedly retain the ability to inflict a retaliatory blow of destructive force. It would be tantamount to suicide for the ones who decided to start war.[7]

Soviet policy at SALT was based on the recognition that the existing nuclear balance could be upset by the deployment of either offensive or defensive systems.

In May 1969, Maj. Gen. V.M. Zemskov, one of the leading Soviet military theorists, wrote in *Military Thought* that the nuclear balance of power could be disrupted if either country sharply increased its offensive forces, or deployed a highly effective BMD. If the United States tilted the balance in its favor, he wrote, the danger of nuclear war would grow.[8] Given this view of the strategic balance, it seems likely that the Soviet leaders' fear of an unconstrained BMD race with the technologically superior United States played some part in convincing them of the desirability of the ABM treaty. At one point during the negotiations, the Soviet Union proposed that BMD systems be considered separately, thus suggesting particular concern about a race in defensive systems.

But this was not the only factor in the Soviet decision to sign the treaty. The Soviet leaders were aware that the deployment of BMD systems would stimulate further development of offensive forces. During the exploratory moves before SALT, the Soviet Union had asked that defensive and offensive systems be considered together. The preamble to the treaty notes that "effective measures to limit anti-ballistic missile systems would be a substantial factor in curbing the race in strategic offensive arms," and in September 1972, Marshal A.A. Grechko, the defense minister, claimed that the treaty would help prevent competition between strategic offensive and defensive weapons.[9]

Some of the arguments advanced against BMD in the Soviet Union were similar to those expressed in the contemporary American debate: BMD would not be effective against a large-scale attack by

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

offensive missiles; BMD deployment would spur the other side into increasing its offensive forces; a BMD race might tilt the nuclear balance in the American favor, and this would increase the danger of war. Although the Soviet conception of the arms race is rooted in a different military doctrine and a different historical experience, the Soviet Union and the United States came to some of the same conclusions about BMD and its effect on the Soviet-American strategic competition.

The ABM treaty thus codified a situation in which the Soviet Union and the United States were equally vulnerable to a retaliatory strike, no matter who struck first. Soviet leaders have continued to recognize this mutual vulnerability. Marshal Ogarkov wrote in 1983 that as a result of the numbers and technical characteristics of the nuclear weapons on either side, the defending side would always retain so many nuclear weapons that in a retaliatory strike it would be able to inflict "unacceptable damage" on the aggressor.[10] And in words that echo the opening Soviet statement at SALT in November 1969, he added that "in contemporary conditions only suicides can wager on a first nuclear strike."

Although the Soviet leaders recognize mutual vulnerability to devastating retaliatory strikes as an objective condition, they do not regard nuclear war as impossible. At SALT, they showed concern about the danger of war occurring as a result of miscalculation, and about the possibility that a third nuclear power might provoke a world war. The "hot line" and the 1971 agreement to update it, the 1971 agreement on measures to reduce the risk of accidental war, and the 1973 agreement on the prevention of nuclear war were all designed to reduce the risks of war by accident or miscalculation.

The Soviet leaders have also thought it prudent to prepare for nuclear war, in case it should occur. Even within the confines of the relationship of mutual vulnerability, Soviet military strategy still focuses on how to wage nuclear war and defeat the enemy. Soviet leaders say that their military doctrine is defensive in purpose, but Soviet military strategy sees the offensive as the primary form of military operation. In a war, Soviet forces would aim to seize the initiative and to inflict defeat on the enemy by means of decisive military actions. As Marshal Ogarkov put it:

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

We are speaking about being able not simply to defend oneself by opposing the aggressor with the appropriate passive means and methods of defense, but of inflicting on him destructive retaliatory blows and defeating the enemy utterly in any conditions of the situation as it develops.[11]

The Soviet leaders recognize the existence of mutual vulnerability to devastating retaliatory strikes, and at the same time feel it necessary to devise a military strategy for the conduct of nuclear war in case it should occur. BMD could, in principle, play a role in waging a nuclear war, and this element in Soviet thinking has led many Western observers to regard Soviet BMD activities since 1972 with suspicion, especially since the Soviet Union has continued to modernize its air defenses, and thus has not abandoned the idea of strategic defense as a whole.

SOVIET BMD ACTIVITIES SINCE 1972

In November 1973, the commander-in-chief of the National Air Defense Forces, Marshal P.F. Batitskii, wrote that "within the framework of the agreements limiting ABM defense, such defenses will in all probability change only qualitatively, and will remain limited in capability, able only to defend the capitals of the countries against prospective means of ballistic missile attack."[12] Since 1972, there has been virtually no discussion of BMD in the Soviet military press. But the Soviet Union has maintained a large and steady R&D effort on BMD technologies.

The Soviet Union is upgrading the Moscow BMD system by replacing the Galosh interceptor missiles with SH-04 and SH-08 nuclear-armed interceptors. The SH-04 is an exoatmospheric interceptor, like Galosh, and the SH-08 is a hypersonic endoatmospheric interceptor, like the American Sprint. New phased-array radars (the Pushkino radar) are being built to perform the engagement function. These activities are permitted by the ABM treaty, which limits the number of interceptors to one hundred, and forbids deployment at any other site. The upgraded Moscow system would be ineffective against a determined American strategic strike, but it could provide some defense against theater systems such as Pershing II, and against nuclear attacks by other powers; it would also provide some defense against accidental launches.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

A recent CIA report has raised the specter of a Soviet breakout from the ABM treaty through the deployment of a nationwide BMD system or of extensive defenses for its ICBM fields.[13] The Soviet Union now has the SH-04 and SH-08 interceptor missiles and the new radars in production and, with its large missile and radar industries, could deploy them on an extensive scale. There is no conclusive proof that this is the Soviet intention, however, and it would take years rather than months to carry out a strategically significant deployment. The system would not be leakproof; it could be overwhelmed, and the radars would be vulnerable to attack. The United States could respond effectively, with relatively modest effort, by improving the penetration of its offensive systems.

The Soviet Union has also been doing extensive research into the use of directed energy for military purposes, and some of this work may be intended for BMD. Most estimates of the quality of Soviet directed energy research put it on a level with that in the United States. But in other technologies that are crucial for BMD, the evidence suggests that the United States enjoys a considerable advantage. According to the U.S. Department of Defense, the United States leads in: computers, optics, automated control, electro-optical sensors, propulsion, radar, software, telecommunications, and guidance systems.[14] There is little doubt that, with its more advanced technology, the United States could make more rapid progress than the Soviet Union towards the development of a space-based BMD system. The Soviet Union, on the other hand, could move more quickly to the deployment of a conventional BMD system for mid-course and terminal defense.

The modernization of Soviet air defenses to deal with cruise missiles and improved bombers has given them the ability to handle smaller radar cross-sections and shorter reaction times, and has thus made them more capable against ballistic missile reentry vehicles (RVs). The problem is most dramatically illustrated by the SA-12 air defense missile, which is reported to have been tested not only against aerodynamic systems, but also against ballistic missile RVs. It may have been designed for use against tactical and theater ballistic missiles, as well as against aerodynamic systems, and it may also have some capability against SLBM RVs. Developments in surface-to-air missile (SAM) technology have made the problem of surface-to-air-missile upgrade, which caused difficulties in the ABM treaty negotia-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tions, even trickier. The treaty could be modified to cope with the way in which technological advances have blurred the distinction between air defense and BMD. This problem could also be addressed unilaterally by the United States if it deployed modest decoys and used existing technology to reduce RV radar cross sections.

A more specific issue of compliance is raised by the new radar near Krasnoyarsk, which appears to be similar to the early warning radars at Pechora, Komsomol'sk-na-Amure, and Kiev. It is oriented outwards, towards the northeast, and could detect Trident SLBMs launched from the Bering Sea or the Gulf of Alaska. If this radar, which is not yet operational, is indeed an early-warning radar, it violates article VI.b of the treaty, which limits the deployment of ballistic missile early-warning radars to locations along the borders of the two countries and requires that they be oriented outwards. The significance of this radar for BMD is negligible because it is not accompanied by interceptor missiles and engagement radars of the Pushkino type, and would be vulnerable to destruction or blackout in a nuclear attack. But it does raise a serious issue of compliance with the treaty.

The Soviet BMD effort since 1972 appears to have had a number of purposes. It has sought to provide Moscow with some defense against accidental strikes or attacks by third nuclear powers. It has tried to develop defenses in those areas not covered by the treaty—against Pershing IIs, for example—and thus supplements Soviet defenses against bombers and cruise missiles. It has provided a hedge against United States breakout from the ABM treaty. It has also explored new technologies that might one day radically alter the balance between offense and defense. Whatever the reasons behind this effort, however, the arguments against BMD advanced by the Soviet Union in the late 1960s—concern about the effectiveness of BMD, the possibility of an arms race in both offensive and defensive systems from which the United States might emerge with an advantage, and the danger of war—still seem to hold sway. Soviet BMD activities since the ABM treaty do not necessarily imply a shift in attitude.

It is nonetheless prudent for the United States to monitor Soviet activities very carefully, and to question them in the Standing Consultative Commission if they are suspicious or ambiguous. It is also prudent for the United States to conduct research into penetra-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tion aids and BMD technologies in case the Soviet Union should decide to break out of the treaty. But current Soviet BMD activities do not justify the claim that the Soviet Union has already broken out of the treaty, or is intending to do so in the near future.

THE SOVIET ASSESSMENT OF THE SDI

The Soviet reaction to President Reagan's "Star Wars" speech of March 23, 1983 was quick in coming. In a statement issued four days later, General Secretary Andropov said that the defensive measures Reagan spoke of would seem defensive only to "someone not conversant with these matters."[15] The United States, said Andropov, would continue to develop its strategic offensive forces with the aim of acquiring a first-strike capability.

> Under these conditions the intention to secure itself the possibility of destroying with the help of ABM defenses the corresponding strategic systems of the other side, that is of rendering it incapable of dealing a retaliatory strike, is a bid to disarm the Soviet Union in the face of the United States nuclear threat.

Andropov claimed that the attempt to build a BMD system would intensify the arms race. At SALT I, he said, the Soviet Union and the United States had agreed that there was an inherent connection between strategic offensive and defensive weapons. Progress in limiting and reducing offensive weapons would be possible only if there were mutual restraint in defensive systems. Now, said Andropov, "the United States intends to sever this interconnection. Should this conception be translated into reality, it would in fact open the floodgates to a runaway race of all types of strategic arms, both offensive and defensive."

Andropov's response to Reagan's speech was hardly surprising. It was inevitable that the American goal of building an effective BMD should be seen by the Soviet leaders as, first of all, a threat to their ability to retaliate in the event of an American first strike. Both President Leonid Brezhnev and Defense Minister Dmitri Ustinov had claimed in 1982 that the Reagan administration was pursuing military superiority as part of its program to destroy socialism as a socio-economic system.[16] The MX ICBM, the Trident D-5 SLBM, the Pershing II, and the land-, sea-, and air-based cruise missile programs

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

were all portrayed as part of a concerted effort to achieve superiority. The Soviet leaders apparently feared that even if these programs did not enable the United States to escape from the threat of retaliation, they might nonetheless give it a preemptive superiority, aimed at reducing the effectiveness of a Soviet retaliatory strike.[17]

Since this was already the official Soviet interpretation of United States policy, President Reagan's "Star Wars" speech was bound to be viewed as a new and dangerous stage in the drive for strategic superiority.

Andropov's response to Reagan's speech also expressed dismay at the implicit intention to abrogate the ABM treaty. Along with other agreements negotiated by the Soviet Union and the United States in the early 1970s, the ABM treaty embodied some measure of common understanding on how best to manage the strategic arms competition without precipitating nuclear war. Andropov chided Reagan for ignoring the link between offensive and defensive strategic weapons, and for failing to understand that BMD deployment would stimulate the competition in offensive systems. Other Soviet commentators have warned that BMD would make war more likely because it would create the illusion of invulnerability, and thus increase the temptation to strike first. It is ironic that these are precisely the arguments that Americans used in the late 1960s to persuade the Soviet Union that BMD was destabilizing.

Soviet commentary on the SDI has taken its cues from Andropov's statement. President Reagan's speech has not provoked any public reconsideration of BMD by the military, who have made the same arguments as other Soviet commentators. The most detailed analysis of the SDI to have been published in the Soviet Union has come from a group of scientists, headed by Academician R.Z. Sagdeev, director of the Academy of Sciences' Institute of Space Research, and by Dr. A.A. Kokoshin of the Academy's Institute of the USA and Canada, working under the direction of Academician E.P. Velikhov, director of the Kurchatov Institute of Atomic Energy and vice-president of the Academy. The title of the working group's report is *The Strategic and International Political Consequences of the Creation of a Space-Based Anti-Missile System Using Directed Energy Weapons*.[18]

This report examines the technological feasibility of a large-scale space-based BMD system, the potential cost of such a system, and the strategic and international political consequences of deploying it. It

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

argues that the creation of a space-based BMD system to destroy one thousand ICBMs in their boost phase is beyond current technological capabilities, and would require significant expansion of R&D work. Even if it could be developed, such a system would be extremely vulnerable to both active and passive countermeasures.

The report's strategic conclusions follow from this technical assessment. If a space-based BMD system is vulnerable to destruction, then it cannot provide effective defense against a first strike, since the attacking side will be able to destroy the system. But such a system might give rise to the illusion that it could provide a relatively effective defense against a strategic force that had already been weakened by an attack. Its deployment would therefore be seen by the other side as a very threatening move. Under these circumstances, each side—both that which had a BMD system and that which did not—would have an incentive to strike first. The net effect of deploying a BMD system would not be to provide escape from mutual deterrence, but rather to make that relationship less stable.

This is the first time that this kind of technical and strategic assessment of new military technologies has been published in the Soviet Union. In the late 1960s, some very eminent Soviet scientists—among them Andrei Sakharov, Lev Artsimovich, and Mikhail Millionshchikov—took part in the discussion of BMD, and their advice may have influenced the change that took place in Soviet thinking at that time (although their assessments of BMD were not published). It is not clear, however, whether Velikhov's committee has any influence on policy-making, or whether its views are the same as those who are engaged in directed energy weapons R&D. Moreover, most of the technical analysis in the report is based on United States sources, and this points to a reluctance to reveal the progress of Soviet research, or to discuss its implications.

The report of the Velikhov committee should perhaps be understood as part of a larger Soviet discussion about the appropriate response to the SDI. In an interview given to the *Los Angeles Times*, Velikhov said that after the "Star Wars" speech he had organized a discussion in the Academy of Sciences. "Its result was very surprising for me," he said. "Not everybody had a real understanding of the issue because rhetorically it is quite attractive to move from offensive weapons to defensive weapons. But the real problem is it's just rhetoric."[19] Velikhov expressed the hope that the Soviet Union would

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

not copy the United States in trying to develop such a system, but added that it would be hard to resist doing so. Even if most Soviet experts counseled against it, he said, those who argued in favor would gain the support of the political leadership if the United States went ahead with the development and deployment of such a system.

Although Soviet spokesmen have been vocal about the SDI, they have been reticent about the purposes of their own BMD activities, and this contrast, though not unusual in Soviet practice, has aroused suspicion in the West. It is true that a great deal of what they have said has been designed to influence Western public opinion. Nevertheless, the Soviet leaders' assessment of the SDI is quite consistent with the view of the strategic relationship that they have expressed since the late 1960s, when they acquired an assured retaliatory capability. Since then they have regarded this capability as a basic condition of Soviet security, and seem to fear that it may now be threatened by United States plans to develop and deploy BMD.

THE SOVIET MILITARY RESPONSE TO THE SDI

The Reagan administration's SDI envisages several years of research and development before a decision is reached, early in the 1990s, whether or not to develop and deploy a space-based BMD system. Most Soviet commentators, even those who show a clear understanding that deployment is many years off, assume that unless an arms-control agreement intervenes, this R&D work on the part of the U.S. will lead to deployment. Soviet scientists have said that they do not believe a perfect defense to be possible. Andropov made it clear that the Soviet leaders regard the SDI as part of an attempt by the United States to gain strategic superiority by augmenting its offensive forces with BMD. Seen in this light, the SDI presents the Soviet Union with the challenge of finding ways to render the defense ineffective.

Three broad options are open to the Soviet Union, either separately or in combination: it can upgrade its retaliatory forces, it can develop weapons that could destroy the space-based BMD system, or it can deploy its own BMD system. Each of these responses needs to be assessed in terms of its technical feasibility, economic cost, and contribution to Soviet military policy.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Offensive Missiles

The Soviet leaders regard their ability to inflict devastating retaliatory strikes on the United States as one of the basic conditions of Soviet security in the present circumstances. Their most obvious response to the SDI, therefore, would be to upgrade their offensive forces in order to ensure that they can penetrate, evade, or overwhelm the defense. They could increase the number of their offensive ballistic missiles, thereby complicating the task of the defense, and diversify their forces by deploying nuclear weapons in space or by making greater use of bombers and cruise missiles, which would not be vulnerable to BMD.

In order to complicate boost-phase interception, which brings the greatest gain to the defense, the Soviet Union could shield its launchers with reflective or ablative materials, thus raising the power requirement for the defense's kill mechanisms. It could also shorten the boost phase by developing fast-burn ICBMs. A payload penalty of about 10 to 30 percent might have to be paid in order to reduce the boost phase from three hundred to sixty seconds, but the gain would be an enormous increase in the difficulty of boost-phase interception.

President Reagan's science adviser, Dr. George A. Keyworth II, has written that "if the fast-burn booster is possible at all, it is probably three to five generations away from those ICBMs the Soviets already have in the works."[20] On the other hand, the Defensive Technologies Study Team, which reported to the Department of Defense in the summer of 1983, concluded that the Soviet Union could develop a fast-burn booster within fifteen years without a crash program.This seems a more realistic estimate than Keyworth's. It is true that the Soviet Union has had problems in mastering solid-fuel propulsion, but its latest ICBMs (the SS-24 and SS-25) and SLBM (the SS-N-20) are all solid-fuel missiles. Moreover, the SH-08 hypersonic endo-atmospheric BMD interceptor missile employs technology similar to that needed for a fast-burn ICBM. This indicates that the Soviet Union could develop fast-burn ICBMs before the SDI reaches the stage of deployment.

Keyworth has also argued that boost-phase defense would cause the Soviet Union "to completely change directions with a fifteen-year investment in 75 percent" of its strategic forces. But even if the Soviet Union were to deploy the new missiles at the same rate as it deployed its ICBMs between 1977 and 1982, it could replace its existing force

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

with fast-burn boosters within ten years. According to CIA estimates, between 1967 and 1977, the Strategic Rocket Forces absorbed no more than 10 percent of Soviet military outlays. (Figures for 1977–1982 are not available, but there is no reason to suppose that the proportion exceeded 10 percent of Soviet outlays in those years either.)[21] It therefore seems that the Soviet Union could reequip its ICBM force with fast-burn boosters without devoting more than 10 percent of its military outlays to this program.

The Soviet Union could also take measures to overload or confuse the mid-course and terminal phases of the defense by deploying more RVs on its existing launchers. The Soviet ICBM force, with its large throw-weight, is particularly well-suited to countermeasures of this kind. The SS-18 ICBM, for example, which is limited to ten RVs under the provisions of SALT II, could carry up to thirty. Decoys could also be deployed, with possibly even hundreds of decoys to one RV. This would present the defense with the formidable problem of identifying the real RVs in mid-course where there is no atmospheric drag to sort them out from the decoys.

Dr. Keyworth has argued that an American BMD system would force the Soviet Union to move away from its reliance on ICBMs and to eschew any thought of a first strike. In a speech in February 1983, he claimed that the Soviet leaders, when confronted with mounting evidence that the ICBM is no longer an effective first-strike weapon, will shift their strategic resources to other weapons systems.[22] But it is not evident that the Soviet leaders will react in this way. Far from considering offensive ballistic missiles obsolete, they are likely to see them as one of the chief means for ensuring penetration and saturation of the defense, and might wish to exploit all their ballistic missile throw-weight for countermeasures.

Dr. Keyworth has also written that "the most immediate argument in favor of developing active defenses" is that "they remove the preemptive option both for the Soviet Union and the United States."[23] It is true that BMD would increase the uncertainties associated with a first strike and might lessen its effectiveness. But it would not necessarily make such a strike less likely. Soviet strategic writings have shown an interest in preemption, in striking first when it is believed that the other side is about to attack—and this is the case to which Keyworth refers in his article. The issue to be weighed in deciding on preemption is not the absolute advantage to be gained

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

from striking first, but rather the balance of advantage between striking first and striking second. If the United States had BMD and could destroy some significant part of the Soviet offensive forces in a first strike, then the Soviet incentive to preempt in a crisis might well be increased, not diminished, by the fear of having to launch a weakened retaliatory strike against the defense.

It seems unlikely, therefore, that the SDI will make the Soviet Union abandon its ICBM force, or that it will necessarily eliminate the Soviet preemptive option. The Soviet Union is likely to want to retain, and perhaps to expand, its offensive forces in order to ensure that they can penetrate or evade the defense.

Anti-Satellite Weapons

The second response the Soviet Union could make is to develop and deploy systems to attack and destroy key elements of a U.S. space-based BMD system. Space mines, anti-satellite weapons, and ground-based lasers, for example, could attack space-based components of the BMD system, while its ground-based elements could be threatened by cruise missiles or other off-shore systems.

The Soviet Union has developed a primitive ASAT weapon, and has been working on the use of lasers for ASAT purposes. According to the latest edition of the Defense Department's *Soviet Military Power*, the Soviet Union could construct "ground-based laser anti-satellite (ASAT) facilities at operational sites" by the end of the 1980s and "may deploy operational systems of space-based lasers for anti-satellite purposes in the 1990s, if their technology developments prove successful." Velikhov has pointed to the need for the Soviet Union to develop the capability to destroy a space-based BMD system. It is possible that R&D in this area has already been stepped up. The Soviet ASAT program did not have high priority in the 1970s, but it could now be given top priority as a possible counter to space-based BMD.[24]

The acquisition of weapons that could destroy the space-based BMD system would increase the Soviet Union's offensive options, and would fit in well with dominant features of Soviet strategic thought. This would require a significant R&D effort on the Soviet Union's part, but such an effort is well in hand. And, as Ashton Carter points out in his contribution to this collection, the technical requirements

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

for effective ASAT are much less challenging than those for effective BMD and would be less costly to develop and deploy.

Ballistic Missile Defense

The third response the Soviet Union could make to the SDI is to deploy a BMD system of its own. It was argued above that the reasons why the Soviet Union limited its BMD deployment in the 1960s still seem to be valid. But this would change if the U.S. moved to deploy strategic defenses, because once the fears that now restrain Soviet BMD activities are realized, the motive for restraint would disappear. The only concern that would remain would be cost-effectiveness.

The Soviet Union might build a BMD system in order to enhance the survivability of its offensive missiles. So far, it has tried to cope with ICBM vulnerability by developing mobile ICBMs, by diversifying its strategic forces, and perhaps by adopting a launch-under-attack policy, but it might deploy BMD if the problem became serious enough. If the United States deploys BMD, the issue of vulnerability will become more important for the Soviet Union, because it will want to ensure that as large a proportion of its offensive forces as possible will be available for retaliation if the United States should strike first. BMD deployment by the United States would thus put pressure on the Soviet Union to deploy its own system.

Apart from such strategic considerations, there are political factors that will encourage the Soviet Union to deploy BMD if the United States does so. The SDI program calls for technology demonstrations before 1990, and these will be seen as symbols of American military and technological power. The Soviet Union may well feel impelled, as it has so often in the past, to try to match the United States program. The heavy stress that the Soviet leaders lay on parity in their strategic relationship with the United States will push them in this direction.

If the Soviet leaders become convinced that the United States is going to proceed to BMD deployment, they might decide to make a "preemptive breakout" from the ABM treaty by building their own conventional BMD system on a nationwide scale. They might do this to show that the Soviet Union would not be overtaken in a BMD race, to complicate United States military plans, or in the hope of gaining some advantage in arms-control negotiations.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Soviet Priorities

The Soviet Union may already have made adjustments to its R&D programs to meet the challenge of the SDI. It is also possible that the Soviet Union, if it is convinced that the United States is going ahead with the deployment of a space-based BMD system, will gradually begin to implement its countermeasures, even before the United States begins deployment. It could start by deploying penetration aids on its existing missiles and then proceed to take further steps to negate the effectiveness of BMD.

Velikhov has recommended that the Soviet Union upgrade its retaliatory offensive forces, and develop weapons that could destroy the space-based BMD system. He, like other Soviet scientists, has expressed considerable skepticism about the feasibility of effective space-based BMD and has argued against its deployment by the Soviet Union. He has even dismissed the "Star Wars" idea as "Lysenkoism," on the grounds that Reagan, like Lysenko, is not willing to let scientific advice stand in the way of his ultimate goal.[25]

In spite of this advice, the Soviet leaders may worry that the United States will manage to develop a highly effective BMD system. They will therefore want to expand their R&D program so that they will be able to field their own system, if they should so decide. Because there is considerable overlap between ASAT and BMD technologies, an extended R&D program would contribute to ASAT as well as to BMD. It is one of the dilemmas of BMD development that it will further the development of effective ASAT, which in turn poses a serious threat to space-based BMD.

SOVIET-AMERICAN RELATIONS AND ARMS CONTROL

The Soviet Union can, in time, develop countermeasures to a possible space-based BMD system. But the Soviet leaders have also set themselves the more immediate goal of trying to stop or slow down the SDI through arms-control negotiations. They are evidently worried about the military and political aims of the United States, and fear that any superiority achieved through the deployment of BMD would not only give the United States a military advantage, but would also enable it to put political pressure on the Soviet Union. As Foreign Minister Andrei Gromyko asked rhetorically in January

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

1985, "Would not the ability [to launch a strike against the Soviet Union and escape retaliation] be used for pressure, for blackmail?"[26]

The Soviet leaders appear to be concerned also about the prospect of a costly technological race with the United States. Notwithstanding the advice of their scientific advisers, they may fear that the United States will develop a reasonably effective BMD system, and they will want, therefore, to forestall such a race. Moreover, they will be anxious to stop the SDI before it gathers political momentum, and Soviet commentary on the interest shown by the United States military-industrial complex in the program suggests that they are well aware of this danger.

In June 1984, the Soviet Union proposed to the United States that the two governments hold talks on preventing the "militarization of space," but then refused to take part when the United States said that it would raise the issue of offensive forces, too. The call for talks indicated that the Soviet leaders were worried by the prospect of an arms race in space, and this was doubtless one of the reasons why the Soviet Union did agree, in January 1985, to begin arms-control negotiations on intermediate-range nuclear forces, strategic offensive forces, and space.[27] In doing this, it put aside the condition it had laid down at the end of 1983, when it had quit the INF and START negotiations, that the United States would have to withdraw its GLCMs and Pershing IIs from Europe before negotiations could be resumed.

The joint Soviet-American statement issued after the January talks between Secretary of State Shultz and Foreign Minister Gromyko specifies that the three areas of negotiation "will be considered and resolved in [their] interconnection," and the Soviet leaders have insisted on the importance of this formulation.[28] The key interconnection is that between offensive and defensive systems. Gromyko has warned that the Soviet Union is not interested in a "seminar" on the SDI:

> The Soviet Union is ready not only to consider the problem of strategic arms, but would even be ready to reduce them sharply—of course, while maintaining the principles of equality and equal security. And on the contrary, if there were no progress in questions of space, then it would be superfluous to speak about the possibility of reducing strategic arms.[29]

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The succession of Mikhail Gorbachev as general secretary is unlikely to lead to a change in policy. In his speech to British members of Parliament in December 1984, Gorbachev said that the "non-militarization of space" and nuclear weapons "ought to be considered and resolved in [their] interconnection"—precisely the formulation that later appeared in the Shultz-Gromyko communiqué.[30]

The Soviet Union has insisted that successful reduction of offensive systems will be contingent on progress in limiting defensive systems. The Reagan administration, on the other hand, has reaffirmed its commitment to the SDI, and to the goal of moving towards a defense-dominant strategic relationship. Paul Nitze, a senior arms-control adviser to the administration, has spelled out this goal clearly:

> For the next ten years, we should seek a radical reduction in the number and power of existing and planned offensive and defensive nuclear arms, whether land-based or otherwise. We should even now be looking forward to a period of transition, beginning possibly ten years from now, to effective non-nuclear defensive forces, including defenses against offensive nuclear arms. This period of transition should lead to the eventual elimination of nuclear arms, both offensive and defensive. A nuclear-free world is an ultimate objective to which we, the Soviet Union and all other nations can agree.[31]

It is clear that the two sides have very different conceptions of the relationship between offensive and defensive systems, and this will make it difficult for them to reach agreement on arms control.

The SDI will also complicate negotiation of an ASAT agreement. The Soviet Union has pressed for such an agreement in recent years, within the broader framework of a treaty on the "militarization of space." Because ASAT systems would be one of the main Soviet responses to space-based BMD, the Soviet Union is not likely to conclude an ASAT agreement unless the United States abandons the goal of deploying space-based BMD. The Soviet Union, in its more recent statements, has dropped any reference to a separate ASAT moratorium, and is likely to press for a treaty that bans the testing and deployment of weapons that can destroy objects in space, or objects on earth from space. An ASAT agreement might put obstacles in the way of the SDI testing program, but a space treaty would have

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the advantage (from the Soviet point of view) of depriving the SDI of political momentum.

The Soviet Union has made it clear that it regards space weapons, and especially space-based BMD, as the most pressing issue for arms control. The United States, on the other hand, regards the reduction of offensive forces—especially the Soviet ICBM force—as a more urgent matter. Although the two sides have different goals, the possibility exists, in theory at any rate, of a trade-off between the Soviet interest in stopping the SDI and the United States interest in reducing offensive forces. A direct trade-off between the two areas is difficult to envisage, because the offensive systems are already operational, while space-based BMD is still at the research stage. Nevertheless, it is conceivable that agreements on offensive forces and defensive systems might be concluded which, although internally balanced, would be linked in the sense of being contingent on each other.

The obstacles in the way of such an agreement are considerable, however, because the two sides have different conceptions of the role of BMD in their strategic relationship. There are, besides, many difficult issues to be resolved in reaching agreement on intermediate-range and strategic nuclear forces. If the negotiations come to an impasse, the disagreements may become the focus of public accusations, of claims and counterclaims, by the two sides. The Soviet Union may make a concerted effort to encourage opposition to the SDI in the United States and Western Europe.

Unless remedial steps are taken—either unilaterally or through arms control—the net effect of the SDI on Soviet-American relations may well be to fuel the competition in offensive and defensive systems, thereby making the strategic relationship less stable; to complicate arms control, and perhaps to make it impossible; and to cast a shadow over political relations. The SDI will not provide escape from mutual deterrence, and may well make that relationship less stable and more fraught with suspicion and uncertainty.

In summary, the main appeal of the Strategic Defense Initiative is that it looks forward to a world in which the two superpowers would have defenses that would render nuclear weapons "impotent and obsolete." But as Richard DeLauer, former Under Secretary for Defense for Research and Engineering, has said, "with unconstrained proliferation [of offensive systems], no defensive system will work."[32]

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

If defensive systems are to contribute to a safer and more stable strategic relationship between the United States and the Soviet Union, they will have to be embedded in a strict arms-control regime that limits offensive systems. In the current political and technological circumstances, however, the attempt to build defenses may well push the other side into expanding and upgrading its offensive forces. It is thus a paradox of the present superpower rivalry that the effort to build BMD can, and very possibly will, undermine the very condition that is needed to ensure that BMD contributes to a safer world.

ENDNOTES

This article is an expanded and updated version of a discussion of the subject that appeared in *The Reagan Strategic Defense Initiative: A Technical, Political, and Arms Control Assessment*, a special report of the Center for International Security and Arms Control (Stanford: Stanford University, 1984). The author wishes to thank Sidney D. Drell, Philip J. Farley, Ted Postol, and George Smith for their help and advice.

[1]V.D. Sokolovskii, *Voennaia strategiia* (Moscow: Voenizdat, 1962), p. 231.

[2]*Pravda*, Oct. 25, 1961; and Theodore Shabad, "Krushchev Says Missile Can 'Hit a Fly' in Space," *New York Times*, July 17, 1962, p. 1.

[3]Maj. Gen. N. Talenskii, "Anti-Missile Systems and Disarmament," *International Affairs*, 1964, no. 10, p. 18; and *Pravda*, Feb. 11, 1967. For a discussion of Kosygin's statement, see Raymond L. Garthoff, "BMD and East-West Relations," in Ashton B. Carter and David N. Schwartz, eds., *Ballistic Missile Defense* (Washington D.C.: The Brookings Institution, 1984), pp. 295–296.

[4]Interview, Radio Moscow, Feb. 20, 1967. Quoted by Garthoff, loc. cit., pp. 295–296. Marshal N.I. Krylov, "Raketnye voiska strategicheskogo naznacheniia," *Voenno-istoricheckii zhurnal*, 1967, no. 7, p. 20. For an excellent analysis of Soviet BMD programs see Sayre Stevens, "The Soviet BMD Program," in Carter and Schwartz, eds., op. cit., pp. 182–220.

[5]Maj. Gen. M. Cherednichenko, "Military Strategy and Military Technology," *Voyennaya Mysl'*, 1973, no. 4, FPD 0043, Nov. 12, 1973, p. 53.

[6]*Krasnaia Zvezda*, Sept. 23, 1983.

[7]As summarized by Gerard Smith, the chief American negotiator, in *Doubletalk: The Story of SALT I* (New York: Doubleday, 1980), p. 83.

[8]Maj. Gen. V.M. Zemskov, "Wars of the Modern Era," *Voyennaya Mysl*, 1969, no. 5, FPD 0117/69, p. 60.

[9]*Pravda*, Sept. 30, 1972.

[10]*Krasnaia Zvezda*, Sept. 23, 1983. See also the article on military strategy in N.V. Ogarkov, ed., *Voennyi Entsiklopedicheskii Slovar'* (Moscow: Voenizdat, 1983), p. 712.

[11]N.V. Ogarkov *Vsegda v gotovnosti k zashchite otechestva*, (Moscow: Voenizdat, 1982), p. 58.

[12]Marshal P.F. Batitskii, "The National Air Defense Troops," *Voyennaya Mysl'*, 1973, no. 11 FPD 0049, August 27, 1974, p. 36.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

[13]See Clarence A. Robinson, Jr., "Soviets Accelerate Missile Defense Efforts," *Aviation Week & Space Technology,* Jan. 16, 1984, pp. 14–16.

[14]On directed energy research, see Department of Defense, *Soviet Military Power,* 4th ed. (Washington, D.C.: U.S. Government Printing Office, 1985), pp. 43–5. See also the FY 1983 *Department of Defense Program for Research, Development and Acquisition,* statement by the Hon. Richard D. DeLauer, Under Secretary of Defense for Research and Engineering, to the 97th Congress (Washington D.C.: U.S. Department of Defense, 1982), p. II–21.

[15]*Pravda,* March 27, 1983.

[16]*Pravda,* July 12 and Oct. 27, 1982.

[17]*Pravda,* July 12, 1982.

[18]Committee of Soviet Scientists for Peace Against Nuclear Threat, *Strategic and International-Political Consequences of Creating a Spaced-Based Anti-Missile System Using Directed Energy Weapons,* (Moscow: Institute of Space Research, USSR Academy of Sciences, 1984).

[19]Robert Scheer, "A Soviet Scientist on the Real War Games," *Los Angeles Times,* July 24, 1983, Section IV, p. 7.

[20]Dr. George A. Keyworth, "The Case for Strategic Defense: An Option for a World Disarmed," in *Issues in Science and Technology,* Fall 1984, p. 42.

[21]Central Intelligence Agency, *Estimated Soviet Defense Spending in Rubles, 1970–1975,* SR 76-10121U, May 1976; Central Intelligence Agency, *Estimated Soviet Defense Spending: Trends and Prospects,* SR 78-10121, June 1978.

[22]Dr. George Keyworth, *Reassessing Strategic Defense,* (Washington D.C.: Council on Foreign Relations, Feb. 15, 1984), p. 18.

[23]Keyworth, loc. cit., in *Issues in Science and Technology,* p. 38.

[24]Department of Defense, *Soviet Military Power,* 4th ed. (Washington D.C.: U.S. Government Printing Office, 1985), p. 44; interview with Velikhov on Radio Moscow, May 25, 1984, *Foreign Broadcast Information Service,* June 6, 1984, USSR International Affairs, p. AA11; on the Soviet ASAT program see Stephen M. Meyer, "Soviet Military Programmes and the 'New High Ground,' *Survival,* Sept.–Oct. 1983, pp. 204–215.

[25]Interviews, Radio Moscow, May 23 and 25, 1984, *Foreign Broadcast Information Service,* June 6, 1984, USSR International Affairs, pp. AA 9, AA 11; and the interview in note 19 above.

[26]"Beseda A.A. Gromyko s politicheskimi obozrevateliami," *Pravda,* Jan. 14, 1985, p. 4.

[27]Other reasons were that the withdrawal from arms-control talks had been politically counterproductive, and that the Reagan administration had changed its rhetoric—and perhaps its policy—towards the Soviet Union at the beginning of 1984.

[28]The joint statement was published in *Pravda,* Jan. 9, 1985, p. 4; Gromyko stressed the importance of this formulation on Soviet television on Jan. 13, 1985; see *Pravda,* Jan. 14, 1985, p. 4.

[29]Gromyko, loc. cit.

[30]*Pravda,* Dec. 19, 1984, p. 4.

[31]Hedrick Smith, "Arms Control Talks Scheduled in March, Administration Says," *New York Times,* Jan. 26, 1985, p. 5.

[32]Richard Halloran, "Higher Budget Foreseen for Advanced Missiles," *New York Times,* May 18, 1983, p. 11.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Christoph Bertram

Strategic Defense and the Western Alliance

THE CENTRAL ISSUE IN THE AMERICAN DEBATE over the Strategic Defense Initiative understandably revolves around the extent to which strategic defenses could improve the security of the continental United States. Yet since the end of World War II, that security has been sustained in a collective system that links America to its allies in Europe and the Far East. The linchpin of these security alliances, which have been so successful in assuring postwar stability, has been the ability of U.S. strategic nuclear forces to deter a possible Soviet attack.

This alliance security system has proved remarkably resilient and effective, despite changing strategic circumstances and the evolution from a U.S. nuclear monopoly in the late 1940s to the emergence of superpower strategic parity in the mid-1960s. It has also remained effective in the face of changing political circumstances, from the cold war tensions of the 1950s to the beginnings of detente in the late 1960s. The alliance security system has survived the Korean War, the Berlin crises, the Cuban Missile Crisis, the Vietnam War, and the recent bitter debate in Europe over the Pershing and cruise missiles. It has functioned from the presidency of Harry Truman to that of Ronald Reagan, keeping the peace between East and West and providing an assuring framework for allied security.

By any standard, this is a remarkable achievement. That a disparate group of sovereign states, widely separated by geography, historic traditions, and political culture should maintain an alliance for more than forty years is a situation that has few, if any, precedents. It is

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

equally astonishing that the system has rested, not on the basis of adequate military defense, but only on that of adequate military deterrence. The raison d'être of NATO has not been that Allied territories be protected by superior war-winning capabilities, but rather by a deterrent capability—provided by the U.S.—sufficient to threaten the survival of any major attacker, even at the risk of America's own survival. Especially once the Soviet Union acquired its own long-range nuclear weapons, the "nuclear guarantee" extended by the U.S. to its European allies implied that America would no longer remain immune from massive destruction if deterrence failed.

Until now, the United States has maintained the credibility of that deterrent threat. The Strategic Defense Initiative, however, could fundamentally alter this state of affairs. With its promise to achieve an effective defense against nuclear weapons, and to alter the strategic relationship between the superpowers, the SDI concerns not only the U.S., but the security of its allies as well.

The European perspective on the SDI in particular, and weapons in space generally, is shaped by a number of factors. First, while European countries are becoming more active in space technology through their expanding civilian space programs, they are still bystanders rather than participants in the military uses of space. This will probably change over time; there are currently plans to develop European reconnaissance satellites and, at a much later date, a manned space station. Nonetheless, it will be many years before the Europeans even begin to approach the scale of military space operations that characterizes the U.S. and USSR programs.

Second, most Europeans have little more than instinctive reactions to proposals such as the Strategic Defense Inititative. The relative dependence of the Europeans on the U.S. for both information and concepts concerning new space-related technologies has hindered Europe from responding to the challenges that the SDI poses for strategic doctrine.

Third, Europeans tend to view major technological developments in political, rather than military or even strategic terms. Their experience over the centuries has led them to conclude that security is, above all, a political task. Europeans ask, more persistently than Americans, what the political consequences of a new weapon system are likely to be. They suspect that, whatever new sophisticated weapons are being introduced, the political problems will remain the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

same. Many Europeans instinctively regard the introduction of major new military technologies either as a threat to stability or as a futile attempt to provide hardware answers to political questions.

My own view is that the space dimension of military competition will matter profoundly to Europe, just as it will to the superpowers. Regardless of whether the promises of the advocates are fulfilled, whether adequate defense against ballistic missiles is feasible, or whether the Soviet Union can keep pace with the United States in the arms race, the effect of a major, purposeful effort to deploy defensive weapons in space will be to generate a political shift of historic proportions. It will introduce into a remarkably stable strategic relationship between East and West an unprecedented degree of uncertainty and nervousness. And it will introduce into the European-American relationship—a relationship that despite repeated strains and occasional dissent has on balance remained harmonious and well-functioning—a profound rift that could break up the Western Alliance for good.

This chapter will address the European perspective by examining the European interests that are relevant to a heightened military competition in space; by detailing specific European reactions to both the ABM debate in the late 1960s and the Strategic Defense Initiative of the early 1980s; and by considering the essentials of the European Alliance relationship with the United States and how they are likely to be affected by a major arms race in space.

BASIC ATTITUDES

In general, the European outlook on deterrence and the likely consequences of deploying weapons in space differs from the U.S. perspective in three important ways: Europeans, despite cyclical doubts, remain convinced that nuclear deterrence is essential to their security and that it can be based only on mutual assured destruction; they have a vested interest, both for international and domestic reasons, in East-West detente and arms control; and they are pursuing, through both the indigenous nuclear forces of France and Britain and the increasing European investment in the scientific and commercial aspects of space activities, interests of their own that are not always congruent with American interests.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Deterrence through Mutual Assured Destruction

Even though France and Britain have minimal nuclear forces, West Europeans fully recognize that their security depends on the nuclear guarantee of the United States and on the ability of either of the two superpowers to obliterate the other should deterrence fail. The potential for mutual assured destruction has seemed to most Europeans, with the exception of those totally opposed to all nuclear weapons, a logical and basically desirable condition. In the European historical experience, vulnerability is a natural state of affairs. With the exception of Great Britain, all European countries have in recent times experienced invasion, occupation, defeat, and victory. Deterrence based on mutual vulnerability corresponds to this experience.

Moreover, Europeans are profoundly convinced that their security rests on America's recognition of its *own* vulnerability. For Europeans, American-European solidarity is not just a matter of declared interests, but of shared fate. Herein lies the reason for the many logical contradictions evident in European arguments that in the past have often annoyed policy-makers and irritated public opinion in the United States. It also helps explain the European reluctance to rely primarily on conventional forces for their security, although this could reduce the likelihood that nuclear weapons might have to be used, as well as European opposition to such American nuclear weapons doctrines as the 1960s strategy calling for the early and massive use of tactical nuclear forces, or to the 1980s doctrine calling for selective nuclear operations, and thus to the militarily more relevant use of nuclear weapons. Finally, there is the European insistence that NATO policy not be predicated on the notion that a nuclear war could be limited to Europe.

These contradictions stem from the simple geographic fact of Western Europe's proximity to Soviet military power. West Europeans are convinced that the United States will remain vitally concerned about Europe only if its own survival is at stake. And they have no doubt that a nuclear war, however limited it may be, could well mean the end of the European states and European civilization.

This European attitude should not be dismissed merely as a parochial, regional perspective. In addition to the aim of tying the power of the United States to the fate of Europe, it reflects a more general view of the nature of strategic stability and security in the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

nuclear age. Its basic tenet is that war as a rational strategy has been overtaken by the dreadfulness of nuclear destruction. Accordingly, security cannot be based on the hope of either winning a nuclear war or successfully resisting a nuclear attack. Europeans are profoundly skeptical that any technological breakthrough will change this basic state of affairs; they instinctively adhere to the view that new military technologies will sooner or later be matched or countered by the other superpower. As a result, most Europeans tend to dismiss as apolitical those strategic abstractions frequently made by American thinkers concerning "intrawar deterrence," "escalation dominance," and "war-winning" or "prevailing" strategies. Even the important distinction between stabilizing and destabilizing technologies is met with skepticism. Most Europeans regard any major change in the structure of nuclear forces as either destabilizing, irrelevant, or both. They dismiss as inherently implausible the vision that new efforts in space might rid the world of the threat of nuclear devastation.

Detente and Arms Control

Americans may differ among themselves and with their European allies about the significance, prospects, and limitations of East-West cooperation. What distinguishes the European from the American debate, however, is that Europe, because of its geographical position, has no alternative to the persistent search for cooperation between East and West. America does have an alternative, one that has been reflected throughout its history in the tension between the isolationist and internationalist strains in American policy.

While Europeans do differ among themselves in the value they place on East-West relations, the experience of the past two decades has produced a consensus that transcends both regional and political differences. Nothing illuminates this more than the current political constellation in Western Europe. In France, there is a socialist government that, in contrast to its conservative predecessor, started off with deep misgivings about Soviet policies but has recently sought to intensify diplomatic contacts with Moscow. In Great Britain, the conservative government of Margaret Thatcher, outspoken in its Atlanticism and in its distrust of Soviet objectives, nonetheless emphasizes the need for constructive East-West relations. West Germany's liberal conservative government today pursues, virtually

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

unchanged, that same *Ostpolitik* of its liberal Social Democratic predecessor it had once severely criticized.

This extraordinary European consensus stems from both international and domestic considerations. Dealing with the regional superpower, the Soviet Union, is a primary task of any European government. Even if Western Europe could ever muster the military strength and political unity to deter Soviet aggression and pressure without outside assistance, that ongoing task would remain. Reinforcing this search for a cooperative relationship with the Soviet bloc are the historical ties that bind Western and Eastern Europeans, ties that are by no means restricted to the Germans, whose divided nation straddles the line between the North Atlantic Alliance and the Warsaw Pact. What makes the risks involved in a policy of detente tolerable to West Europeans is the deep-rooted conviction that the United States is inherently stronger than the Soviet Union, and that, in the long run, the forces making for political pluralism in Eastern Europe are stronger than those of repression. Unlike many in the United States, Europeans have always been conscious of the limitations to Soviet power, both in Europe and beyond.

There are also important domestic reasons why Western European countries, at least those that profess to depend on the American nuclear guarantee, have sought an alternative to confrontation with the Soviet Union. Spurred on in part by the European peace movements, governments have realized that nuclear reliance on the United States is politically acceptable only if it is constantly accompanied by arms-control efforts. The art of compromise, which is sometimes regarded by Americans as a camouflage for defeatism, is a natural occurrence in European politics.

Arms control, then, has instinctive support in European public opinion as well as in most government circles. The specter of a new arms race in space is therefore met with grave concern. European support for arms control may at times be too eager and too uncritical, as was the case during the 1982–83 Soviet-American negotiations over intermediate-range nuclear forces (INF). Europeans are often naive in their assumption that any compromise is better than none. Nevertheless, there is in the European body politic a deeply rooted feeling in favor of arms control that shapes basic attitudes towards both existing arms-control negotiations between the superpowers and major new military programs like the Strategic Defense Initiative.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Ultimately, initiatives such as the SDI, unless accompanied by *bona fide* arms control efforts, will be viewed with skepticism and concern.

Specific European Interests in Space

The European attitude to military competition in space, including both space-based ballistic missile defense and anti-satellite capabilities, is also influenced by the effect this competition will have on the nuclear forces of Britain and France and on the growing European commercial investments in space.

Originally, the French and British nuclear forces were an expression less of military concern than of political prestige. But in recent years, the strategic rationale for these forces has become more pronounced. As the strategic and political limits of American extended deterrence have become more marked, not least as a result of the bitter INF debate in Europe, the supporters of an indigenous nuclear capability in Great Britain and France have become more determined to maintain these capabilities. Even among the nonnuclear countries of Western Europe, the French and British nuclear forces are no longer seen merely as costly prestige objects of otherwise declining powers.

At present, both Britain and France are trying to keep abreast of the technological advances in the arsenals of the superpowers. France has decided on a major program to multiply the number of missile-carried warheads from the current 98 to 594 by the early 1990s, in particular through the introduction of MIRV technology, and little opposition has been voiced against these plans by any of the French political parties. In Great Britain, the Thatcher government has firmly committed itself to the purchase of Trident D-5 SLBMs from the United States. When deployed in the 1990s, the number of British warheads could increase from the current 64 to as many as 896 (assuming a maximum deployment of 14 warheads per missile). Although the opposition Labour Party is committed to canceling the program if the party should come to power, it is worth remembering that Labour has usually supported the British nuclear forces when in government. If anything curtails the size of the Trident program, it is more likely to be cost considerations than political opposition.

Even with the realization of these modernization programs, however, a major BMD effort by the Soviet Union would weaken French and British nuclear deterrence significantly. While most experts

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

doubt that any BMD system could protect vital targets against a massive attack, such a large-scale attack would stretch the strategic capacity that France or Great Britain could mount, even with the expanded arsenals they are planning for the 1990s. It is true that, given the high number of warheads available by then, the Soviet Union could not hope for total immunity from French or British strikes.[1] Yet if the Soviets were to embark on an ambitious defense program, the deterrent credibility of both countries would inevitably erode. For these reasons, both London and Paris have been less than enthusiastic about eventual deployments.

Another European interest is the freedom to operate satellites in space without interference from other powers. Although the European space program lags significantly behind that of the United States, the European Space Agency (ESA) is establishing a presence in space that is beginning to be commercially viable. Of the total commercial satellite launches forecast for the next three years, fully one-third are or will be European. In addition, the member states of ESA have agreed on the development of a new rocket booster, the Ariane 5, which in the early 1990s could launch a manned space station into orbit.

While the ESA programs are designed exclusively for non-military purposes, they do have two consequences for European reaction to the introduction of weapons into space and to the development of anti-satellite capabilities. First, as an actor in space, Europe has a vested interest in prohibiting military interference with its own satellites. Second, European countries might be forced into a more active, military role in space to protect their assets, should the superpowers engage in a major effort to track and destroy enemy satellites. While there is no European military space program at present, the technical capabilities for such a military role are evolving.

To sum up, America's European allies have reacted quite negatively to any major weapons efforts in space, even those ostensibly designed to provide greater security for the West. Europeans regard with skepticism, if not outright apprehension, any attempt to shift from the present structure of deterrence. They worry about the impact an unbridled military competition in space will have on arms control and East-West relations, as well as on their growing space assets.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

EUROPEAN REACTIONS TO AMERICAN PROGRAMS: ABM AND SDI

The general European concerns about ballistic missile defense have been expressed specifically on two occasions: in the late 1960s during the American anti-ballistic missile (ABM) debate and recently in reaction to the Reagan administration's Strategic Defense Initiative.

In the late 1960s, when the first debate on strategic defense took place, two questions dominated European reactions: how a functioning Soviet BMD system would affect the credibility of the then much smaller British and French strategic forces, and whether such a system on both sides would enhance or weaken the American nuclear guarantee to Europe. While some British and French strategists worried about the former, the latter issue was far more important, and here European strategic opinion was almost unanimously skeptical that BMD systems would make much of a difference to the credibility of the U.S. nuclear deterrent. As Alastair Buchan wrote at the time, "The American response in a crisis is envisaged more as an act of political will than of strategic calculation. . . BMD would have to be shown to reduce American casualties to something near zero in the event of central war to affect the argument about the credibility of the U.S. guarantee for Europe."[2]

Moreover, it is important to remember that ABM, in the late 1960s, was never presented even by American advocates as anything other than an adjunct to the established system of deterrence. The ABM debate did not involve a fundamental reversal of strategy, but merely issues of cost-effectiveness and marginal improvements within the existing doctrine. The U.S. government itself seemed to have deep-seated doubts about the technical feasibility and the strategic relevance of the new technologies. Since the debate did not suggest a change in the fundamental nature of deterrence, European opposition to the American plans could afford to be fairly muted.[3]

Today, the situation is very different. The Reagan administration has repeatedly emphasized that it seeks not merely to improve the current system of deterrence, but to effect a total reversal of strategy: from the predominance of deterrence by threat of second-strike retaliation, to the predominance of defense by threat of destroying attacking ballistic missiles in flight. It is this radical change in attitude—regardless of whether the strategic defenses are ever

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

deployed—that is creating the deepest worry among European governments.

These European concerns can be summarized as follows. First, it will be technically impossible to create a leak-proof defense against attacking missiles. An imperfect defense, on the other hand, will produce strategic instability, especially if both sides retain or increase their sizable offensive forces so as to overcome any projected defensive system. Moreover, the deployment of even an imperfect system could be interpreted by the adversary as an attempt to obtain a first-strike capability.

Second, Europeans suspect that the deployment of defenses will provide little additional security for Western Europe, bordering as it does on the countries of the Warsaw Pact. The result, they fear, will be a strategic decoupling of America's security from that of Western Europe, resulting in a "fortress America," with an unprotected and unprotectable *glacis* in Europe.[4]

Third, the bitter and protracted debate that took place in the early 1980s over the deployment of U.S. intermediate-range nuclear forces (INF) in Europe has left its mark. Those who favor the INF deployment believe that these systems foster an increased solidarity of risk within the Alliance, precisely because these weapons can reach targets in the Soviet Union, thus further exposing the U.S. to Soviet retaliation. Those who oppose INF, however, maintain that these systems manifest an American desire to limit a possible nuclear war to Europe. A major effort to build a BMD shield around the United States would undercut the arguments of those who have stood by the INF deployment decision.

Finally, Europeans are concerned with the impact of SDI on the resources of the Alliance as a whole. The SDI raises the specter of a new strategic arms race that could siphon off much-needed defense funds as well as scientific and industrial resources. Defense resources are likely to remain limited; even the United States will be unable to maintain its current defense spending increases in the face of mounting budget deficits. Given the enthusiasm in the White House for the SDI, Europeans fear that when the squeeze comes, the administration will not only increase pressure on them to carry more of the conventional military burden, but might also reduce its NATO-related defense spending. An American preoccupation with strategic defense could thus weaken the existing defense in Europe.[5]

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The Reagan administration has sought to diminish such fears by claiming that defense against missiles targeted on Western Europe is both possible and intended. But so far, European governments, including both political elites and most defense experts, have remained unpersuaded. Europeans, in short, doubt not only that BMD can improve NATO security; they profoundly question the wisdom of a shift from a policy of deterrence to a defense that most probably will remain very imperfect. Apart from a few isolated voices in European strategic circles, the European reaction to date has been almost unanimously hostile. Especially outspoken against the proposed Strategic Defense Initiative have been a number of staunch pro-Atlanticists, including President Mitterand of France; West German Defense Minister Manfred Wörner; British Foreign Secretary Sir Geoffrey Howe; and former French Foreign Minister Claude Cheysson.[6] The French government in June 1984 went so far as to propose formally to the Geneva Disarmament Conference that a five-year ban be placed on the deployment and testing of directed energy anti-ballistic missile systems on the ground, in the atmosphere, or in space. And both France and Great Britain have expressed concern over the effect of a superpower BMD race on their strategic forces.

Yet, with the notable exception of the French government, European leaders have recently muted their original opposition, choosing instead to play down the issue. This should not be misinterpreted as a decline in European uneasiness, but rather as a growing awareness of Reagan's commitment to the project. No European government wishes to confront single-handedly the strategic option chosen by a U.S. president. The possibility of banding together, to speak with one European voice, has foundered on the familiar European inability to formulate a joint position on controversial security issues.

Instead, European governments have so far adopted a "wait and see" attitude. They do not object to the continuation of SDI research in the U.S., and have even expressed an interest in being involved in these efforts. But they have also made it clear that they regard the ABM treaty as an important contribution to arms control that they would like to see maintained. And they have assigned to the United States the burden of proof that strategic defenses will neither decouple Europe from America, nor undermine strategic stability between the superpowers.[7] In the meantime, European governments

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

are hoping that other obstacles will impede the SDI; these could include the U.S. Congress reducing SDI funding, an inability to demonstrate the technical feasibility of various BMD systems, or an arms-control agreement to block an arms race in space.

Thus, President Reagan's vision of a world in which ballistic missiles have lost their threat is not shared by his European allies, even those who, by and large, stand firmly behind the stationing of American Pershing and cruise missiles in Europe. For, underlying the European misgivings is a deep fear that, once firmly underway, the SDI could shake the very foundation on which the Alliance and Western security have rested so far in the nuclear age.

SDI AND THE ESSENTIALS OF THE WESTERN ALLIANCE

These European fears are justified. If the research program of the SDI is followed by an attempt to attain virtual protection against nuclear missile attacks, then the basic philosophy that has maintained the cohesion of the Western Alliance since 1949 would be called into question. This is so not only because of the technical implications of the SDI, but, even more important, because of the political dynamics to which it would give rise.

What are the direct strategic implications for the Alliance? In answering this, two assumptions can and must be made. The first is that, whatever the current doubts over the technical feasibility of a leak-proof, comprehensive defensive system of both point and area defense, the analysis of its strategic and political implications must rest on the premise that such a system will eventually be deployed. It is true that some limited protection of missiles and command centers could prove strategically valuable. Yet this is not the goal of the SDI; the president of the United States has unambiguously rejected this modest and partial objective. As a result, all American efforts under his presidency, and possibly beyond, will appear as steps towards a comprehensive protective strategy. To judge the SDI on its possible intermediate applications and not on its professed goal would run counter to the objective defined by the president himself.

The second assumption is that the Soviet Union will sooner or later acquire a defense capability similar to that of the U.S.. Admittedly, the Soviets are believed to be well behind in many of the technologies—computers, optics, guidance systems—necessary for BMD, and this

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

has led many in the U.S. to believe (and in the Soviet Union to fear) that it may be possible for America to obtain a one-sided advantage in strategic defense. However, there is nothing in the history of arms competition in the nuclear era to suggest that such an advantage will be durable. As Albert Wohlstetter has pointed out, American strategic analysts in the past have often tended to underestimate the vigor and depth of the Soviet armament effort. The USSR has repeatedly demonstrated its ability to catch up with the United States in modern weaponry, even at very high costs to its economy. Any sound analysis of the longer-term prospects must therefore base itself on the assumption that the superpowers will attain roughly equal capabilities, not only to protect themselves against missile attacks, but also to penetrate the enemy's defenses.

From the European perspective, the major issue is whether only U.S. targets would be protected against ballistic missile attacks, or those in Western Europe as well. If the former were true, then clearly the sense of shared risks between Europe and the United States would be called into question. Extended deterrence would cease to be credible, and the only credible use of Soviet nuclear forces would be against non-American allied targets (i.e., in Western Europe and the Far East). Similarly, the only credible use of U.S. nuclear forces would be against targets outside the USSR (i.e., in Eastern Europe). In short, this would conjure up the vision of a nuclear war limited to Europe, a scenario the West Europeans have been striving for thirty years to avoid.

The consequences of this would be politically unbearable for the Western Alliance. America's European allies would lose what they have always regarded as an essential component of their security: the deterrent effect of the link to the U.S. strategic nuclear arsenal. Neither American nuclear forces stationed in Europe nor indigenous European strategic forces could make up for this loss of security. Because it would be possible for the first time in the nuclear age to limit nuclear conflict to the European region, the deterrent effect of American tactical nuclear forces (TNF) in Europe would be reduced to the damage their limited use could inflict. No longer would this be backed by the uncertainty of escalation. A preemptive Soviet strike against American tactical nuclear forces in Europe would lose its risk for the attacker, just as a nuclear strike against other Western European targets would, for the first time, become militarily rational.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

An increased effort to build up indigenous nuclear forces in Europe would merely multiply systems that have lost their threat. Europeans would simply be relying on deterrent forces that could be blunted by Soviet action but that could not retaliate against Soviet territory. Even if the Western Europeans should try to circumvent Soviet defenses against ballistic weapons by opting for nonballistic nuclear delivery vehicles instead, the absence of the threat of American nuclear involvement would deprive such a move of any significant deterrent effect.

In other words, Western Europe would find itself for the first time in the history of the Atlantic Alliance exposed to the very strategic situation the Alliance was created to avoid: a Soviet superiority in nuclear and conventional military strength that could not be offset by the threat of U.S. strategic involvement in a European war.

Would European reaction to the Reagan proposals change significantly if the defensive shield against ballistic missile attack were to cover *both* the United States and its European allies (assuming, on the other side, that the Soviet Union would extend its defensive shield over its East European allies)? Probably not, although Western European governments in their first reactions to the Strategic Defense Initiative have implied otherwise. Leaving aside the political problem of the presence of additional large-scale missile deployments in Europe, the major feature of a BMD world would remain: the security cord of potential escalation to the strategic nuclear level between Europe and the United States would be broken. The risk for the Soviet Union of a major attack against Western Europe would be significantly lower than it has been throughout the nuclear age. Moreover, even if a BMD shield were to cover Europe as well, the Allies would, by the mere fact of geography, remain exposed to other nuclear weapon attacks: by artillery, aircraft, or cruise missiles.

Conversely, the other side of the Atlantic would remain relatively protected by sheer geography against shorter-range or slow-flying nonballistic nuclear systems. At the same time, the U.S. would be unable to deter Soviet action by raising the specter that any major conflict might escalate to the nuclear strategic level.

But could not *some* degree of defense against missile attacks—the protection of vulnerable military targets such as missile silos and command centers, for example—enhance the deterrent capability of the Alliance? Could not a certain measure of protection for strategic

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

forces and command centers enhance strategic stability by improving the survivability of second-strike forces, thus gaining time for controlled reaction in case of crisis and war?

If this were a realistic objective, it might be possible to reconcile American and European views. However, the SDI philosophy of the Reagan administration is quite opposed to any limitation of defensive capabilities to specific military targets. Whatever limited protection might become possible is not an end in itself, but a step towards the ultimate objective: to replace deterrence by defense. As long as this is the case, it matters little for America's allies (or, indeed, her opponents) whether the outcome will remain modest in the end. What matters is the strategic conviction behind it. The vision of a leak-proof defensive system that would remove the threat of nuclear missiles is a political objective, an expression of what the administration would like to achieve and an indication of its view of a desirable strategic future. This view is incompatible with the European understanding of, and European interests in, the Western Alliance.

Throughout the postwar period, America's central contribution to the NATO security partnership has been its willingness to regard an attack on Western Europe as an attack on itself. Such an extension of a nation's security commitment cannot be made credible by words, or even by the overseas deployment of sizeable military forces; it can only be made credible by a real solidarity of risks. For the past thirty years, the vulnerability of the United States to nuclear attack, coupled with her military presence in Europe, has manifested that solidarity of risk. Although it could never be guaranteed, and never precisely defined, it was nevertheless clear to friend and foe alike that any major attack against Western Europe contained a real possibility of U.S. strategic retaliation. Deterrence against war in Europe was and still is based on this threat. The absence since 1945 of East-West conflict in Europe, a continent filled with weapons, is attributable not least to the United States becoming, through the link of nuclear vulnerability, a direct member of the European balance.

It is true that this central link has always been difficult to define with precision. In part, it is the product of strategic interest as well as traditional relationships and the sense of common threat. Those strategists who regard deterrence as the result of specific force

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

relations have long been uneasy with it, particularly since the emergence of U.S.-USSR strategic parity in the early 1970s. Since then, the risk for Americans of the U.S. commitment to European security has no doubt increased. Yet the very question whether America would, in the event of a war, be prepared to risk its own cities for the sake of preventing a strike on Hamburg or Paris has been besides the point, because no attacker could be quite certain about the answer. In the late 1960s, British defense secretary Denis Healey formulated a law that still holds today: it does not matter whether the West Europeans are 90 percent certain that the United States will uphold its nuclear guarantee: what matters is whether the Soviet Union is 10 percent uncertain that the United States might. Despite the growth of Soviet nuclear forces since the 1960s, this uncertainty remains, and provides the basis for extended deterrence and the U.S. nuclear guarantee to Europe.

The objectives behind the Strategic Defense Initiative of the Reagan administration threaten to undermine this basic bargain of the Atlantic Alliance. The SDI indicates that the United States wants to escape from the risk of a European conflict. In the past, deterrence has worked because the U.S. was both unable and unwilling to forgo this solidarity of shared risk. The United States may still be unable to do so, but there is no concealing the fact that the United States is now actively pursuing a course that, if implemented, will amount to restricting conflict to Europe. This policy profoundly weakens both deterrence and Alliance cohesion. The U.S. nuclear guarantee that has been so central to the Alliance becomes meaningless unless the United States is both vulnerable to nuclear attack and capable of adding its nuclear power to deter an attack on Europe. If the scenario of roughly equal superpower BMD capabilities were realized, however, the U.S. would be neither.

The president's Star Wars vision and the Strategic Defense Initiative are not just another case of American infatuation with the promises of military technology. They suggest a fundamental shift away from past strategic concepts as well as from the basic philosophy of the Alliance itself. For Europeans, the American strategic vision is one more expression of a shift in the American world outlook, away from coalition politics and towards an assertive, protected United States acting on its own.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

It is true that the transatlantic strains of the past several years have generated in Europe as well a search for alternatives to the present Atlantic security arrangement. In particular, Europeans have developed an aversion to an over-reliance on nuclear deterrence. Moreover, there are growing anxieties that modern weapons, with their rapid reaction times and dependence on real-time intelligence, might make the survival of the world a hostage to computer systems. Strategic defense systems, with their reliance on automated command-and-control, could heighten these concerns and, with them, popular resentment to nuclear deterrence.

The SDI therefore risks undermining, on the U.S. side, the basic bargain of the Alliance, and on the European side, the acceptability of nuclear weapons and nuclear deterrence. Furthermore, the two trends are reinforcing each other. The more Europeans display an aversion to nuclear weapons, the more the United States will avoid committing its security to the uncertainties of European politics.

The final question is this: is it worth risking the future of the Western Alliance for the sake of uncertain and doubtful technological promises? Is it worth, on such shaky foundations, instilling in Europeans the fear that they will be left to themselves in the face of Soviet military power, and in Americans the illusion that a European war would not profoundly shake their own security? Since the birth of the Alliance, the Soviet Union has understandably sought to undermine the unity of the West. So far, it has not succeeded; Western cohesion has remained strong.

Ironically, those who believe that the world can be made safe against nuclear attack will themselves end up undermining this cohesion.

ENDNOTES

[1]See Lawrence Freedman, "The Small Nuclear Powers," in Ashton B. Carter and David N. Schwartz, *Ballistic Missile Defense* (Washington, D.C.: The Brookings Institution, 1984).

[2]Alastair Buchan, "Western European Reactions to BMD," *Hudson Institute Discussion Paper*, mimeograph, June 24, 1966, p. 4.

[3]Laurence Martin, "Europe and Ballistic Missile Defense," The Atlantic Institute, mimeograph, Oct. 1968.

[4]These doubts were first formulated by West German Defense Minister Manfred Wörner, with the apparent approval of his European colleagues, after they were

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

briefed on the SDI by Caspar Weinberger at a meeting of NATO's Nuclear Planning Group, held in Turkey in April 1984. See *Süddeutsche Zeitung*, April 5, 1984.

[5]This also seems to be the reason why U.S. General Bernard Rogers, the Supreme Allied Commander in Europe, has repeatedly displayed skepticism towards the SDI project.

[6]For a report of a televised interview given by President Mitterand, see *Le Monde*, Dec. 18, 1984. On March 15, 1985, Sir Geoffrey Howe gave a major policy address on the SDI at the Royal United Services Institute in London; see the *Times* (London), March 16, 1985. See *La Croix*, July 11, 1984 for an interview with Cheysson.

[7]The speech given by West German Chancellor Helmut Kohl on Feb. 9, 1985, at the international Wehrkunde meeting in West Germany was the first to summarize these points.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Foreign Perspectives on the SDI

John Wilkinson

IT MIGHT BE EXPECTED that after thirty-five years of successful deterrence of war in Europe, there would be steadily improved understanding between the United States and the European members of the NATO alliance, and an ever-growing consensus about strategy. Instead, misunderstandings proliferate and new military concepts all too often become the subject of acrimonious altercation. It is lucky indeed that so strong are the imperatives that impel Americans and Europeans alike towards a common purpose within NATO, that the doubters and disinformers are usually confounded, the Alliance surmounts its vicissitudes, and our joint security is preserved.

Even so, as each successive cause célèbre becomes a focus of controversy, impassioned demonstrations, and debate, it is worth remembering the democratic values, the rule of law, and the common heritage of freedom shared by the West Europeans and their United States allies that far transcend the periodic differences of political and strategic perspective that divide them. The military threat from the Warsaw Pact remains so real, the Soviet system so oppressive, and the Russian empire so menacing, that deterrence of potential Warsaw Pact aggression and prevention of Soviet expansion remain the priorities that unite the whole Western Alliance in a common cause.

Nevertheless, each new measure that has been proposed to enhance NATO's deterrence and defense—the proposed deployment of enhanced radiation weapons, INF modernization, the doctrine of follow-on-force attack, the Strategic Defense Initiative—has been met by such a barrage of controversy and of criticism as far to exceed the credibility of pure coincidence. By contrast, there is little public outcry in Western Europe against the Soviet's chemical warfare capability, their deployment of SS-20 missiles, their huge strategic nuclear arsenal, or even their willingness to use military force to invade either neutrals like Afghanistan or supposed allies like Hungary and Czechoslovakia.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

It is not surprising, therefore, that President Reagan's Strategic Defense Initiative should have been predictably met at worst by a barrage of hostile European reactions or at best by outright skepticism of the kind suggested by the remarks of the British foreign secretary, Sir Geoffrey Howe, to the Royal United Services Institute for Defence Studies in March 1985. The chancellories of Western Europe seem uncertain how to react to the SDI and what possible changes to the superpower relationship might ensue.

If the SDI were carried through to a successful conclusion it could nullify the Soviet's principal military effort, which has been the modernization of their strategic and intermediate-range ballistic missile forces. Furthermore, the SDI promises that the United States may match, and it is to be hoped soon surpass, that other notable Soviet national effort—the development of space technology for military purposes, of which the deployment of an operational first generation anti-satellite system and research into directed energy weapons are but two examples. It would be wrong to exaggerate the influence of Soviet disinformation in the European strategic debate. Nevertheless, the East-West war of words and influence in Europe is very real.

There is undoubtedly strong concern in the U.S., as in Europe, over the mutual balance of terror that has characterized the preservation of peace in the NATO area through nuclear deterrence since World War II. The nuclear freeze movement in the U.S. and the Campaign for Nuclear Disarmament in the U.K. exemplify public disillusion with what is often perceived as a costly and morally indefensible as well as dangerous nuclear arms race. In Europe, the influence of the so-called peace movements is so strong as to complicate the execution by the Dutch government of the NATO "twin-track" decision on the deployment of cruise missiles and to induce the Danish government not to pay its share of the infrastructural costs of INF modernization.

In these circumstances, the president of the United States is particularly justified in assigning increased priority to assuring the integrity of the West's nuclear forces against a Soviet first strike. If the objectives of the SDI research program can be realized, namely, to establish whether a system of space-based defense against ballistic missile attack is technically feasible within a reasonable time frame and at a politically and economically affordable cost, then some of the sense of public repugnance towards NATO's reliance on nuclear

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

weapons could be eliminated and the West's deterrent favorably endorsed by a much wider constituency.

There is, after all, nothing dramatically novel in protecting the West's nuclear deterrent against preemptive attack. In the 1950s and 1960s, when the B-47s and B-52s of Strategic Air Command provided the ultimate nuclear guarantees of Western Europe's freedom and security, nobody questioned the rationale of the air defense forces of both manned interceptors and, increasingly, surface-to-air guided missiles that protected the SAC bases, and it must be said, protected the French and British nuclear bomber bases also.

When towards the end of the 1960s, the Soviet armory of intercontinental ballistic missiles and intermediate-range ballistic missiles grew, the construction of ballistic missile early-warning stations was uncontroversial. The development of point defense anti-ballistic missile systems was halted by the anti-ballistic missile treaty of 1972 primarily because increased ballistic missile accuracy and the perfection of multiple independently targetable reentry vehicles (MIRVs) gave to the offense an advantage that could only be outweighed at inordinate cost.

Even so, since then the Soviets have enhanced their anti-ballistic defenses around Moscow, constructed a major phased-array radar facility at Krasnoyarsk, and improved their civil defenses, all of which demonstrate that they do not desire the doctrine of mutual assured destruction to apply to the Soviet Union. As for the West, the notion of some Europeans that, for the American nuclear guarantee to Western Europe to hold good, the United States must be demonstrably just as susceptible to nuclear devastation as Western Europe in the event of the breakdown of deterrence, is to stand logic on its head, as well as to fly in the face of geographic and strategic reality.

The reality for the West Europeans is that their collective unwillingness to bear the cost of a fully effective conventional defense against a manifestly offensive Soviet war machine that already dominates half their continent leads them to rely, in event of war, on an early recourse to nuclear weapons to redress a military imbalance that imperils their freedom and survival as sovereign nations. The paradox is that NATO's strategy of a graduated nuclear response that is underpinned by the threat of an ultimate escalation involving the strategic nuclear forces of the United States has to deter Soviet aggression, even though in this era of strategic nuclear equivalence

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

and total vulnerability to ballistic missile attack, the United States mainland would risk devastation in the process.

An effective space-based defense affording Western Europe and the United States alike a measure of protection against ballistic missile attack could only increase the likelihood that, in an escalation beyond recourse to tactical nuclear weapons, enough of Western Europe would survive for the invocation of the United States' strategic nuclear guarantee to be worthwhile; and that the United States homeland would be inviolate enough to render credible a strategic nuclear retaliation on Western Europe's behalf. In short, vulnerability to ballistic missile attack can only degrade the United States' nuclear guarantee to its Western European allies. A space-based defense system, however, would couple even more indissolubly the common security of the European and American components of the NATO alliance.

European critics of the SDI question its cost. This is understandable, but the projected investment of some $26 billion in the SDI research program through the end of this decade is not excessive in view of the potential benefits. These benefits are not just industrial, although Chancellor Kohl in his Wehrkunde speech and Prime Minister Thatcher in her address to both houses of Congress showed an appreciation of the potential gains for European technology in an SDI research program shared by Western Europe and the United States. European participation in the NASA space station has been welcomed; so it should be in the SDI.

After all, it was the Europeans, notably Dr. Werner Von Braun and his team, who pioneered the use of space technology for military purposes. Hitherto, with the main exception of reconnaissance and communication satellites, military space technology has been dominated by ballistic missile development and has been primarily offensive. The SDI would augur the advent of a global defensive space-based security system that could build confidence between nations.

Space-based sensors and ballistic missile interception devices, if fully feasible, could instill confidence worldwide that surprise nuclear attack is unlikely to prevail, lifting a sword of Damocles from mankind. Funds invested in the SDI may diminish the scale of investment required in the next generation of ballistic missile systems. Even if a space-based defense were not wholly reliable, no potential aggressor would any longer be certain that he could destroy any

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

particular target, and the probability of effective retaliation would be vastly increased. Preemptive nuclear attack as an instrument of policy would be negated and even the potential for nuclear intimidation and blackmail of a huge arsenal of ballistic missiles would be nullified. Far from representing a purely national umbrella symbolizing the American detachment from Western Europe, the SDI represents the United States' global engagement for peace and security on behalf of the free world. Only space-based systems offer a possibility of protection worldwide against ballistic missile attack.

If pusillanimity still prevails on the part of the Europeans, it lies in their collective failure to redress adequately the threat to their freedom inherent in the continued hostile occupation by the Soviet armed forces of half of their continent. West European pacifism and neutralism are largely the products of fear. When NATO enjoyed undisputed nuclear dominance over the Soviet Union in the 1950s and early 1960s, the peace movements were virtually nonexistent. If the SDI succeeds, Western Europe could enjoy a measure of protection against all nuclear ballistic missiles except the most short-ranged. The threat of Finlandization at the hands of the Soviet Union would diminish, and genuine detente would ensue, not as a product of a desire to appease an overmighty neighbor, but from a justified sense of heightened security and confidence.

Finally, it is often wrongly imagined that the critics of the SDI somehow speak for responsible opinion in Europe and are representative of the European consensus viewpoint on the subject. This is not true. Some of the most thoughtful and authoritative defense specialists in Europe are as enthusiastic about the SDI as is the United States administration. Many believe that U.S. determination to pursue both the SDI and the development of an anti-satellite system has helped to bring the Soviets back to the nuclear-arms negotiations in Geneva. It is also widely recognized in Europe that the West's highly innovative and productive economic system offers a measure of technological advantage over the USSR that should be exploited to improve the security of the West. This is manifestly the case in the technologies of the SDI.

There is in Western Europe only one international Parliamentary Forum competent by treaty to debate and recommend security policy, namely, the Assembly of Western European Union. Last year, it debated and passed two reports, drafted by myself, on the military

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

use of space. Both were overwhelmingly carried, most notably the second one which dealt at length with the SDI, after a lengthy research visit to the U.S. by the Aerospace Committee and the Rapporteur. It is worth, in conclusion, quoting verbatim the final five paragraphs of this report which summarize clearly the views of the many European supporters of the SDI:

There has been much loose talk of decoupling from Western Europe resulting from the deployment of space-based defense on the part of the United States. It is strange that the proliferation of offensive nuclear systems on the part of the Soviets is so readily accepted by the Western Europeans, whereas the construction of a space-based defense by the United States that would diminish the vulnerability of Western Europe to all but short-range ballistic missile attack is so often criticized.

It does not mean that the United States would be prepared to unleash a preemptive nuclear first strike against the Soviet Union believing that its own heartland was relatively secure and leaving Western Europe open to Soviet nuclear retaliation. First, NATO is a purely defensive alliance and the United States would not attack first. Second, even the most futuristic space-based triple-layered ballistic missile defense system will never be 100 percent effective. Some ballistic missiles would still get through thus ensuring that mutual deterrence based on the continued capacity of each side to inflict unacceptable damage on the other would continue.

What would be diminished is the risk of a Soviet nuclear first strike upon the United States. The Soviet Union has been building up a strategic ballistic missile arsenal of great precision and destructive power. The Soviet drive to strategic (and intermediate-range) nuclear superiority would be nullified. Western Europe would be less subject to Soviet nuclear intimidation and blackmail in operation. Furthermore, our United States allies would regard as more credible the NATO doctrine of graduated flexible nuclear response since escalation to the strategic level to ensure the national survival of the Western European allies could be contemplated without risking the total nuclear devastation of mainland United States. Deterrence would therefore be heightened and the risk of war diminished. Unable to gain an advantage over NATO by the proliferation of offensive nuclear ballistic missiles except at inordinate cost, the Soviet Union would be more likely to negotiate an agreement to reduce such offensive systems.

Lastly, there is the reassurance that a global space-based defense would protect the free world from nuclear attack by miscalculation, error, the act of a madman or from a proliferation of ballistic missile systems to nations other than the five present nuclear powers.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Mankind has expended almost immeasurable resources in the development, construction and deployment of awesome engines of mass destruction. If only a modest fraction of that expenditure were devoted to research into defensive systems, we could judge whether a ballistic missile defense is feasible at reasonable cost. If man can be landed on the moon and permanent space stations assembled in orbit, the likelihood is that such a defense is practical and not the science fiction that people believe it to be.

T.B. Millar

PRESIDENT REAGAN'S Strategic Defense Initiative has posed a number of dilemmas for the Australian Labor Party (ALP) government led by Bob Hawke. The government, and indeed the majority of Australians, still strongly supports the American alliance as their ultimate defense, yet the ALP includes strong and highly vocal left-wing elements that are anti-American and, more specifically, anti-nuclear. Hawke and his foreign minister, Bill Hayden, are ideologically committed to the control and reduction of nuclear weapons, a goal the SDI is supposedly designed to promote. Yet despite the arguments and rhetoric espoused in support of the SDI, they believe in their minds, and feel in their bones, that the initiative is much more likely to lead to an increase than a decrease in nuclear armaments; to destabilization rather than stabilization of the nuclear balance; and to a breach of the 1972 ABM treaty. Mutual assured destruction is bad enough; might not "Star Wars" be far worse, with its technological momentum riding roughshod over saner political judgments?

Although Australia had in early 1984 made clear to Washington its attitude to the SDI, the desire of the United States a year later to have its allies make known their position (and preferably support the project) came at a time when Australia's sense of security was shaken by what appeared to be the collapse of the 1951 treaty between Australia, New Zealand, and the United States (ANZUS). The prime minister of New Zealand, David Lange, had forbidden the entry into New Zealand ports of American (or any other nation's) nuclear-powered or nuclear-armed warships. The United States reacted with a heavy hand, pushing Lange into a corner from which he had no

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

retreat except by capitulation, a position in which the more he was kicked by Washington, the more he was applauded by his compatriots. The American action was primarily *pour encourager les autres*—to make recalcitrant Europeans (including Neil Kinnock), Japanese, and perhaps even an Australian Labor Party government think twice before defying U.S. strategic policies. For most of this century, there has been no stauncher defender of Western values, and indeed of Western alliances, than New Zealand, and while Hawke regretted Lange's action, he regretted even more the hasty rupture of a system that had kept the Southwest Pacific secure for forty years.

Hawke had a second problem. His predecessor, Liberal leader Malcolm Fraser, had committed Australia to providing modest facilities for the American MX testing program off the Australian coast. Hawke saw no reason to cancel that assistance, or to tell more than a select number of his Cabinet colleagues about it. When the matter became public in February 1985 as a result of an inquiry carried out under American Freedom of Information legislation, Hawke was just about to leave for Europe and Washington. There was a considerable public outcry, and a rapid counting of heads among his parliamentary caucus led Hawke to rescind the earlier agreement. It did not look very good to Washington, but no one knows better than an American president or politician that if you don't have the numbers, you don't deliver the goods; you might not survive to fight another day. Many Australians would have liked their prime minister to have taken a more robust stand (either way), and the Opposition gleefully took him to task. Hawke explained to President Reagan and Secretary of State Schultz the refinements of Australia's refusal on MX and lack of endorsement of the SDI. They exercised a kindly forbearance over the ambiguities of his position.

The Australian minister for defense, Kim Beazley, who has been more vocal than his colleagues on the details of the Australian position, has generally the same objections to the SDI as those expressed by the British foreign secretary, Sir Geoffrey Howe, in his speech in London on March 15, 1985. Beazley does not criticize the motives of the United States; he acknowledges that the Soviet Union has already entered this field of research, and that the U.S. must at least match it. But he has serious misgivings about whether the SDI could ever achieve what is hoped for it. He believes it likely that, if the USSR were to find itself being confronted by a deployed, layered,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

space-based, anti-missile defense system, it would produce systems designed to overwhelm such defenses with multitudinous new weapons and countermeasures, as well as develop and increase such alternative measures as submarine-launched cruise missiles based close to the American coast. He is troubled that decisions regarding research appear to be transmuting into decisions on strategy and deployment and is concerned about the massive expenditure involved, both in terms of defense cost-effectiveness and alternative social benefits foregone. He also believes that any attempt by one superpower to obtain a qualitative superiority would jeopardize arms-control efforts as they are currently conducted. Hayden went further in suggesting that the SDI might offer some protection to the United States but might well not protect Australia.

It is widely stated that the SDI has brought the Russians back to Geneva. Hawke and Beazley acknowledge this belief, but not that it is necessarily true. While the SDI may be *a* factor, the primary one is probably the Soviet failure to prevent INF deployments by withdrawing from Geneva and engaging in a major propaganda exercise, and its subsequent delay in "getting its act together." The boycott had failed to achieve its purpose, so there was no point in prolonging it unduly.

Along with sixteen other of America's allies, Australia was invited to take part in the research for the SDI. Unlike most of the others, however, it refused. The public evidence suggests that the Australian government would have preferred not to have been invited, as this would have made it easier for them to defuse the issue in electoral terms. Secretary of Defense Caspar Weinberger ignored such niceties: the Reagan administration had its own overriding domestic imperatives and did not want to differentiate between allies. Why did the Hawke government reject the invitation? One could argue, as Opposition parties have done, that the research will be done whether or not Australia participates; that participation would benefit Australia financially and scientifically; that it would give Australia a modest voice in the direction of the research and its subsequent potential use; that much of the research is, in any case, of a conventional, or not definitively nuclear, nature; and that the United States as our major ally has a right to expect Australian support. While the Hawke government has been diffident about explaining its reasons for refusing to participate, it is widely believed in this country that any

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

new research linked to American nuclear capacities is far too hot a potato for a Labor administration to handle. At the best of times, the Australian government lives uneasily with the philosophy of mutual assured destruction, and this applies not only to its left wing. It has come to accept deterrence and the contribution of the two major satellite ground stations at Pine Cap and Nurrungar in central Australia, as well as the North West Cape Communications Station, to the West's deterrence system. The U.S. government has assured Canberra that the two facilities will not be used for SDI purposes, and the Australian government is prepared to accept such assurance. In the short term, warning of Soviet nuclear launches is fed by satellite through Nurrungar. With deployment of the SDI, however, Nurrungar will presumably not be required for this purpose, and Australia need claim no responsibility for the deterrent protection afforded it by the United States.

An earlier, but ongoing, joint Australian-U.S. research project, extensively misrepresented in the media, caused a great fuss in 1984. The project researched electromagnetic means of propelling projectiles at very high velocities (more than five kilometres per second); it is known as the "railgun." The idea has been around for most of this century. It was developed in the early 1970s by two scientists at the Australian National University, was then taken over by the Defence Department's Materials Research Laboratory, and was later made a cooperative venture with the U.S. under a 1968 research agreement (updated in 1979) between the two governments. It was discussed publicly in 1981, but became a major issue only last year as a result of being taken up by anti-nuclear protesters. The Australian government, sensitive to such opposition, appears to be phasing out the research, which to its relief had reached no further in Australia than considering use of such propulsion within the atmosphere. What the U.S. is doing, with far greater dedication of resources, is not publicly known or appreciated and is thus irrelevant as an Australian electoral issue.

The invitation to participate in SDI research touched the same nerves as had reacted against the railgun, and the controversy over the latter—ill-informed though much of it was—reinforced government caution over the former. By requiring a response within sixty days—even though assessment of the technical and political implications of the request could clearly take much longer—Secretary

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Weinberger stamped the offer as essentially one of political expediency. (The U.S. government has since extended this deadline.) The invitation was seductive, but its purpose seemed demonstrably less to improve the quality of the research than to reduce political opposition to the SDI within the U.S. and among its allies. To oppose the SDI while engaging in SDI research would require a contortion beyond the capacity of the Labor Party, whose philosophy is less sophisticated than that of its European counterparts.

As is the case with other issues, the Australian government finds itself straddling the middle of the political spectrum. On one side is the left wing of the party and the equally vociferous Australian Democratic Party, with seven seats in the Senate, and the Nuclear Disarmament Party, with one. On the other side, the formal Opposition coalition of the Liberal and National parties is split between those, such as former treasurer John Howard, who accept virtually the whole of the Reagan-Weinberger position, and those, such as Shadow Foreign Minister Ian McPhee, who support a degree of research but are still troubled about the implications of deployment, especially as it affects the ABM treaty. Among the media, the presently conservative *Australian* supported the Opposition, while the more liberal Melbourne *Age* supported the Hawke government: "A Prudent Refusal" was the title of its editorial on the subject.

The whole SDI debate is only a part—and perhaps for Australia, unlike Western Europe, a fairly transitory part—of a wider consideration of nuclear weapons and Australian security. On the SDI and MX, Australia has taken a line more akin to that of Europe, or the American opposition, than to that of the Reagan administration. This reflects genuine views on arms control and disarmament as much as concessions to left-wing opinion. Yet overall—and "Star Wars" *is* a long way off—Australia still stands solidly with the West. It places no bans on ship visits. It engages in joint exercises. It contributes, as well as receives, intelligence information. It provides hostages to fortune in the three major U.S. facilities. As Prime Minister Hawke said in his June 6, 1984 speech about U.S. deterrence: "Australians cannot claim the full protection of that deterrence without being willing to make some contribution to its effectiveness." To be part of the SDI is not yet seen as constituting such a contribution.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Marie-France Garaud

Take good care to sift things
from the sound they make.
Seneca

THE STATE OF PEACE Europe has known for the past forty years would seem to be almost a miracle, particularly if one considers the large disparity among the existing military forces. On the one side we have a huge, overpowering, and hegemonic empire; on the other, a tiny, self-centered, and prosperous Europe. The lopsidedness nevertheless remains in balance. This is doubtless a result of a multitude of imperceptible pressures that cancel one another out, as well as the presence within the Atlantic alliance of the United States' military power, which has served to offset, and even conceal, the inherent imbalance of the situation. But to claim that the Soviet Union's aggressive impulses have been checked solely by the West's determination would be quite as wrong as claiming that no such wicked impulse ever crossed Soviet minds. One factor, for example, that has surely contributed to stability in the region lies in the nature and dynamics of the opposing regimes. Impulsive military actions pose a great danger to a totalitarian police-controlled empire: the ferment of internal disintegration is reactivated with each Soviet conquest. The defensive alliance facing it tends, on the contrary, to go soft and weaken in an atmosphere of detente. It is fair to say that everything depends on the strength of the Allies and their ability to pull together, as well as on their far-sightedness and capacity for taking advantage of new situations.

It was following the great panic unleashed by the USSR when it seized almost a third of Europe that the Alliance's military organization was established. This alliance rested, first, on the contribution of conventional forces by allied European states, and second, on the United States' commitment to Europe—above all, by means of its nuclear weapons. The latter was considered so vitally important by all concerned that the responsibility for providing leadership of the Allied states fell quite naturally to the United States.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

This military organization has served its purpose, and since the signing of the North Atlantic Treaty on April 4, 1949, the dividing line between the two societies squaring off against each other has not budged at all. But it would be futile to shut our eyes to the changes that have taken place over the past twenty years, changes that are creating an increasingly noticeable military, if not political, gap between the United States and its European allies.

In the early 1960s, the emergence of weapons decisive in their destructive power and indestructible because they could not be instantly pinpointed (primarily submarine-launched nuclear weapons) shifted the prevailing balance to an absurd military standoff. Since the capability did not exist to defend against a retaliatory attack, a belligerent nation could initiate an attack only by exposing its territory to a counterblow it could not ward off. A direct showdown between the superpowers was therefore ruled out. But there still remained the question of whether such a disincentive extended to certain gray zones such as Western Europe. The growing power and technological advances of the Soviet Union, combined with the increased sophistication of highly accurate and miniaturized nuclear weapons, has made this an increasingly critical question.

The United States has, from the moment it first recognized its vulnerability to a Soviet ballistic missile attack, been casting about for a strategic alternative to the one that sufficed when the sheer fact of distance assured its invulnerability. It was because he foresaw this possibility that General de Gaulle provided France with its own independent nuclear force that could deter direct threats to its territory and sovereignty.

Yet despite its renewal of official pledges of support, the U.S. has expressed troubling doubts over the past twenty-five years as to the extent and nature of American commitments in Europe:

* The administration of President Kennedy took measures designed to contain the risks the United States might run in agreeing to defend their European allies;

* Senator Mansfield in the 1960s and early 1970s proposed amendments aimed at reducing U.S. ground forces in Europe;

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

* U.S. statesmen Kennan, McNamara, Bundy, and Smith have urged that the United States repudiate first use of nuclear weapons on Europe's behalf;

* Defense analyst Jeffrey Record argued in 1977 that NATO nuclear weapons were so vulnerable that the Alliance was almost "begging" the Soviets to launch a preemptive attack against them;

* The supreme command of NATO in 1977 wanted to give priority to conventional armaments in Europe;

* U.S. Defense Secretary Caspar Weinberger stated in 1982: "The truth is our defense policy has not only become outdated as a result of the new threats hanging over our security, it has lost all credibility because it has not taken into account the worsening of our global military position and has proved to be incapable of meeting them."

Since 1982, the U.S. has undertaken, and to a large extent achieved, the rehabilitation of its military power that had—relative to the USSR—weakened during the years of "detente." And the decision by all the Western countries to allow deployment of U.S. intermediate-range missiles in Europe in order to restore the credibility of the American commitment doubtless eliminated the risks of decoupling between Europe and the United States.

But the fact remains that sparing the American continent any real threat of nuclear attack is a temptation for, and an abiding concern of, U.S. political leaders. President Reagan's Strategic Defense Initiative (SDI) is the fullest expression of this desire. Now, there is no question of denying or disputing the very serious consequences posed for Europe if this project, in its current form, should be carried out. Nor can one avoid questions of its feasibility, the time required for its development, and its inherent limitations.

All the indications are, however, that we are entering a period in which the strategic concepts developed as a result of postwar scientific breakthroughs will be undergoing far-reaching changes. Current technology is already making advances in three complementary areas of weapons design: the conquest of space; control of electronic computation and artificial memory; and the development of speed-of-light weapons (lasers and particle beams). The operation of the U.S. space shuttle and the development of anti-satellite missiles that can be fired from planes are upsetting the distinction that long

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

existed between atmosphere and outer space. It is in keeping with the maxim "who holds the high ground holds the low" that the race to utilize space for purposes of observation, communication, and destruction is gaining momentum. From now on, power—especially military power—will be held by whichever country controls space.

The mastery of artificial intelligence combined with almost infinite computer memory and computation capacity are going to make sweeping changes in war strategy. The element of surprise will become increasingly difficult—perhaps impossible—to achieve, whether the attack be by land, water, or space. The time is approaching when the position of any object, even a submarine, may be determined by correlating an infinitely large number of indices, none of which is at the moment sufficient to provide this information. "Offensive" deterrence, that is, threatening to destroy the adversary, is even now becoming more difficult, and the possibility of such a change is already beginning to be felt.

The conquest of space for military purposes is the true goal of the implacable struggle being waged between the United States and the Soviet Union, even as the two nations seek to divert world opinion by going through the pretense of negotiating disarmament agreements affecting weapons systems that are on the verge of becoming obsolete. If the two superpowers succeed in setting up defense systems that increase their invulnerability as new technologies permit, the consequences will indeed be far-reaching. To begin with, since such a state of affairs would be sure to devalue the *existing* strategic nuclear armaments of the two countries, as well as those of France and Great Britain, their quantities would have to be increased in order to maintain deterrence. One obvious consequence of this would be that medium-sized nations, already considerably overtaken in the technological race, would ultimately find it impossible to utilize the strategy of "the weak deterring the strong" by means of nuclear weapons; there would be a gradual reversal to the strategic situation of the immediate postwar years, in which Western European countries found themselves protected less and less by deterrence, and more and more vulnerable to conventional attacks or short-range weapons such as cruise missiles that are hard to intercept.

Even if Americans try to convince us otherwise, we know that the consequences of such a reversal will be far more serious for those countries in close proximity to the potential aggressor. Whether we

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

like it or not, the vast strategic transformation that is currently taking place is leaving Western Europe partly disarmed, and is adding to the defense problems posed by our inherently precarious geographical situation. The Soviets, fully exploiting the diversity of perceived interests within the Alliance, could come very close to achieving the goal they have so patiently been working towards: a decoupling of U.S. strategy from that of its European allies that would enable them to step up pressure on those parts of the continent still outside their control. Gromyko and Gorbachov are working at it with visible satisfaction.

While there is still uncertainty about the form and scope the SDI will eventually assume, we must recognize that there is little chance of its actually being abandoned. It is one thing to hope the SDI will not undermine our attitudes and defense capabilities, and quite another to believe that such wishful thinking can change the course of the venture. For in presenting his project, the president of the United States drew on a number of powerful trends—the irreversible technological revolution, the terror of nuclear war so deeply expressed by American public opinion, and the recurring temptation of Americans to embrace an isolationist foreign policy. Even if it does not result in the deployment of a completely foolproof defense system, the SDI holds out other substantial advantages for the United States in the way of new research, industrial strength, and a tremendous boost to the economy. Space is going to become *the* indispensable environment for carrying out experiments that will lead to scientific advances in every area, and such civilian implications are certainly closely intertwined with military aspects. The SDI is only the tip of the iceberg: the scientific, economic, and technological potential is vaster still.

Man is always trying to expand the limits of his understanding: "progress" is merely the fulfillment of his insatiable curiosity. In a way, the conquest of space bears certain similarities to the great discoveries of the fifteenth and sixteenth centuries. It is a challenge that will dominate the early twenty-first century. Nothing will stop the most able and gifted nations from entering a race that holds the potential for considerable disruption. Tomorrow's major powers will be those that will have successfully met these new challenges, and Europe will have to provide itself with the means for doing so. It is

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

therefore vitally necessary for us to have our *own* space program—within the framework of our alliance with the United States—that utilizes man in space.

This goal is technically and financially within Europe's reach. But there are many obstacles along the way that we will need to overcome: the touchy self-centeredness so common to small nations; the jealousy on the part of the scientific community of nations advanced in high-technology; the intellectual difficulty of envisaging a different future; the refusal to transcend a European policy that has become desperately mired in the special interests of a conservative mercantilism; an inability to grasp the urgency of the problem and invest the necessary skills and resources.

The nations of Europe have a choice: they can either one by one become absorbed in American projects, thereby putting themselves in the ever-vulnerable position of subcontractors; or they can decide to pool their skills and resources in order to pursue an independent space policy that would succeed in launching a European manned spacecraft. This latter achievement would provide confirmation of the European technological capacity, and display the political will to take part in the SDI program as partners, not as subcontractors. This objective will naturally be reached only when research now underway, especially in the United States, permits decisions on technologies to be utilized in developing future SDI programs.

Only when Europe, spearheaded by Germany and France, has provided itself with the fundamentals of an independent space policy, will it be in a position to make its voice heard and to assume its role in the Alliance's strategic discussions. France's choice in 1960 to develop its own nuclear forces caused an uproar. Yet it was a sensible and far-sighted choice. An awkward ally is better than a disarmed ally. Similarly today, we will only be able to influence a military policy on which our survival depends if we carry weight—if we are partners in the conquest of space, and partners who cannot be sidestepped.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Jeffrey Boutwell and F.A. Long

The SDI and U.S. Security

FROM ITS INCEPTION in early 1984, the Strategic Defense Initiative (SDI) has become one of the most controversial and widely discussed new programs introduced by the Department of Defense in many years. The objective President Reagan announced for the U.S. in 1983 and that he, Secretary of Defense Weinberger, and others have reiterated is dramatically simple: to replace our current reliance on deterrence of nuclear attack by threat of retaliation with reliance on a fully effective defense to protect the U.S. and eventually its allies from all attacks by nuclear weapons. If this defense can be obtained, first against ballistic missiles and then against other weapons systems, and if the U.S. can have high confidence in the continuing effectiveness of the defense system, the threat of nuclear destruction of the U.S. will have been eliminated. This is a grand and appealing objective; is it feasible?

Before examining this question and other complex issues raised by the SDI, it may be helpful to recapitulate the principal points made by supporters and opponents of the program.

Supporters of the SDI assert that:

(1) the United States must strive to move away from deterrence based on the threat of nuclear retaliation towards protection by complete, nationwide defense;

(2) even if a complete defense against nuclear weapons is unattainable, partial defenses will be feasible and will reinforce deterrence by retaliation;

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

(3) the U.S. enjoys both technological and economic advantages over the Soviets and ought to exploit its strengths;

(4) at least while the SDI is in the research stage, it is essential that the United States not be constrained by arms-control agreements that might limit research into the development and utility of strategic defenses. Besides, it is difficult to arrive at joint agreements with the Soviets and they cannot be counted on to honor them;

(5) major new space-based technologies for defense appear to be possible and must be studied, if for no other reason than the Soviet Union might develop them first. Even though some of the technologies that hold promise may not work out, the research program will discover others that will. Finally, the Strategic Defense Initiative is a research program; development decisions will be made only after some years, when the effectiveness of new technologies has been established.

Opponents of the SDI maintain that:

(1) the goal of an impregnable defense is an illusory vision that is unobtainable for several reasons: the task is inherently difficult, requiring major advances in technology; the Soviets will devise countermeasures to U.S. deployments; defenses suffer from unfavorable cost effectiveness, particularly if one strives for a near-perfect system; a space-based defense system is highly vulnerable;

(2) while limited defenses, especially those of hardened military targets, are feasible, their cost-effectiveness is uncertain, there are other ways of protecting these targets (mobility, redundancy), and they do not eliminate dependence on deterrence by second-strike nuclear retaliation;

(3) the Soviets can respond to an American build-up of defenses against their nuclear weapons with a variety of relatively low-cost measures including shortened launch times for missiles; increased numbers of missiles; increased numbers of warheads, decoys, and other penetration aids to accompany the warheads; maneuverable warheads to counter terminal defenses; and deployment of ASAT systems to counter U.S. space-based systems;

(4) the cost of a multi-tiered BMD system will be enormous: $60 billion for research alone in the next eight years, and estimates

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ranging from several hundred billion to $1000 billion for final deployment of the full system. The need for defenses against other modes of delivery will aggravate the problem and increase the costs;

(5) a major U.S. program to develop strategic defenses will only succeed if offensive forces are greatly reduced and constrained, yet the SDI, if pursued unilaterally, could foreclose the possibility of negotiating joint reductions in nuclear arms;

(6) the projected U.S. defense program is an attempt to apply military-technical solutions to what is basically a political problem between the U.S. and the Soviet Union. The SDI must be a well-integrated component of an overall political strategy aimed at reducing tensions and confrontation between the two nations, enhancing mutual security, and decreasing the probability of nuclear war.

This simplified list by no means exhausts the issues raised by the SDI. Supporters and critics of the program also argue over the value of strategic defenses for U.S. allies in Europe and the Far East and express concern over the effects escalating SDI costs might have on funding for other military programs, especially in light of increased costs for military weapons in general. However, the most controversial issues of the SDI remain the feasibility of President Reagan's central objective and the impact the SDI and follow-on programs will have on U.S. national security—in particular on the character of the relationship between the U.S. and the Soviet Union.

The overwhelming response of informed U.S. experts, including scientists, diplomats, and retired military officers, is that in today's world of opposing superpowers, the goal of perfect defense is unattainable. The reason is clear. If the U.S. moves toward a perfect defense, the Soviet Union will be forced to respond, since a fully effective U.S. defense would eliminate Soviet deterrence capability. Furthermore, the Soviets have the wherewithal to deploy a variety of effective and comparatively inexpensive countermeasures: they can build more nuclear weapons, deploy more warheads per missile, shorten greatly the boost time for missile launch, deploy decoys for missiles on the ground and for warheads in flight, and attack and destroy vital components of the U.S. defensive system. The development of these countermeasures will certainly impose costs and burdens on the Soviet defense establishment, yet the time scale for

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

researching, developing, and testing any of these countermeasures is well within the period predicted for the development and deployment of U.S. defenses.

Paul Nitze, a senior advisor to the administration, recently stated that a U.S. defense system must be survivable and cost-effective, and "if the new technologies cannot meet these standards, we are not about to deploy them."[1] But obvious Soviet countermeasures can insure that a fully effective U.S. defense will be neither cost-effective nor fully survivable.

Cannot new technologies overcome these obstacles? Since the U.S. does not yet have even the initial technologies necessary for its projected defense, the question would seem to be unanswerable. However, to attain the goal of perfect defense—one that will free Americans from the threat of nuclear destruction—in the face of Soviet opposition seems indefinitely remote, regardless of new technologies we may succeed in developing. After all, both nations can and will play the new technology game, each for its own objectives.

Consideration of defense against a delivery mode whose technologies are already quite well understood will illustrate the point. The U.S. will eventually require fully effective defenses against the Soviet delivery of nuclear weapons by intercontinental bombers. Can we expect to develop an impenetrable defense? For thirty years, the Soviets have been developing costly, elaborate, and steadily improving air defenses against U.S. bombers; nevertheless, the U.S. Air Force remains confident that its bombers, equipped with penetration weapons such as nuclear-armed cruise missiles, can still attack and destroy targets inside the Soviet Union. To underscore its conviction, the Air Force is developing two new intercontinental bombers, the B-1 and the Stealth. In contrast, can the U.S. realistically remain confident in its ability to develop and deploy air defenses capable of preventing any penetration by next-generation Soviet bombers and their missiles? It does not seem conceivable.

Arguments against the feasibility of an impregnable defense do not apply to the feasibility of partial defenses that the U.S. might deploy in order to protect valuable military targets such as command-and-control centers and missile silos. The problem of maintaining cost-effectiveness against Soviet countermeasures would persist, but would not involve the exceedingly unfavorable cost ratios that characterize the final stages of developing an impregnable overall

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

defense. In addition, these partial defenses need not always strive for full protection of the targets they defend. For example, if partial defenses could limit destruction from a major Soviet attack to three-fourths of the Minuteman and MX missiles in silos, the remaining 250 missiles, in conjunction with surviving U.S. bombers and SLBMs, would still constitute a formidable retaliatory force.

Limited and focused defenses of this sort would not eliminate the threat of destruction of cities and industry; the U.S. would have to continue to rely on deterrence by the threat of second-strike nuclear retaliation. The operative question for the United States would then be whether the benefits of deploying such limited defenses outweigh their military and political costs—especially as their deployment would necessitate the abrogation or re-negotiation of the ABM treaty and could lead to an increase in Soviet offensive nuclear weapons.

THE POLITICAL APPEAL OF STRATEGIC DEFENSES

Although many administration spokesmen and supporters of the SDI have argued in favor of limited objectives, the president has continued to stress the goal of achieving a total defense of the United States and its allies. There are obvious political reasons for doing so. Apart from the intrinsic appeal of building perfect defenses against nuclear weapons, there is the danger that presenting the SDI as only a means for bolstering retaliatory deterrence might not generate the domestic support needed to win Congressional approval of a greatly expanded SDI program. George Keyworth, the president's science advisor, has directly confronted those in the administration and elsewhere who advocate limited defenses, saying that "if these arguments continue to be used as the basis to achieve congressional and allied support . . . the opportunity for strategic change—and the president's objective—is lost."[2]

The political appeal of the president's goal of "saving lives rather than avenging them" makes it easier to understand why Reagan took the unusual step in March 1983 of announcing the goal of a perfect defense after only negligible preliminary study and consultation.[3] There is little doubt that President Reagan genuinely believes that a nationwide defense against nuclear weapons is possible. Yet the president and his advisors might also have reasoned that his call for a revolution in nuclear strategy would deflect much of the American

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

and European criticism at that time of his administration's nuclear force buildup and arms-control policies.[4] It was certainly more than coincidence that Reagan's call for perfect defenses came at the end of a speech aimed at generating public support for increased defense spending, and during a period when there was considerable Congressional opposition to the MX missile program.

The administration has also sought to take the political high road concerning the SDI and the March 1985 resumption of superpower arms-control negotiations. In comparison to 1983, when there was widespread criticism of new U.S. missile deployments in Europe, the administration's support of the SDI is far more politically tenable. By emphasizing the exploratory nature, non-nuclear character, and defensive goals of the SDI, the administration can more easily shift the burden of proof onto the Soviet Union for lack of progress in the Geneva arms-control talks. The U.S. refusal to agree to limitations on the SDI program is plausible in the sense that restraints on technology research programs are difficult to negotiate, much less monitor. Nonetheless, to claim that restraints should not be placed on an effort that holds out the promise of ending reliance on offensive retaliation could be counterproductive if the SDI effort proves to be a major stumbling block in reaching agreement on reducing offensive forces.

Finally, SDI supporters can also reasonably claim that the program provided essential leverage in getting the Soviets back to the arms-control table in March 1985. It is also true, however, that the Soviet walkout from the 1983 arms-control talks was a demonstrable failure. Having failed to stop the deployment of U.S. Pershing and cruise missiles by their propaganda campaign and refusal to negotiate, the Soviets were gaining nothing by staying away from Geneva. Only by resuming negotiations could the Soviets hope to constrain the continuing U.S. offensive nuclear build-up (MX, Trident D-5 SLBM, the B-1 bomber and hundreds of sea-launched cruise missiles), which by the late 1980s will increasingly threaten Soviet strategic forces, especially their ICBMs.

Yet, whatever short-term benefits the SDI may have provided in the way of domestic politics and arms-control negotiations, a greatly accelerated strategic defense program also poses numerous short-term risks. It will be many years before conclusive technical and military evaluations can be made of the president's goal of total defenses. Within a few years, however, the SDI could have severe

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

political ramifications that would guarantee that the U.S. will never reach the goal of a comprehensive defense—regardless of the ultimate feasibility of the technologies now being explored.

THE POLITICAL RISKS OF THE SDI

It is generally recognized by both supporters and critics of the SDI that in order to provide effective nationwide protection, strategic defenses must be accompanied by substantial reductions in offensive forces. Administration spokesmen claim that the SDI program, and Soviet apprehensions over U.S. technological know-how, could prove beneficial in negotiating successful arms reductions. There could be some truth in this. While the Soviets have the capability for building very effective countermeasures to U.S. BMD systems, Soviet leaders probably do not relish the prospect of a heightened competition in both offensive and defensive weapons systems. The Soviet Union has devoted many years to reaching strategic parity in offensive systems with the U.S., and there is little chance that a new competition in strategic defenses would improve the overall Soviet military position.[5] There is also, however, little chance that such a competition would benefit the U.S., given that the Soviets will devote the resources necessary for countering an American BMD system.

Any attempt to move from a world of offensive deterrence to one of protection by defense must therefore be a mutual one. Again quoting Nitze, the transition period to a defense-dominant world must be "a cooperative endeavor with the Soviets," in which "arms control would play a critical role."[6] Within the administration, there are currently fundamental differences of opinion on the utility of arms control that must be resolved. There are also serious contradictions between the administration's rapidly expanding SDI program, its offensive nuclear weapons buildup, and its arms-control efforts.

To take one example: the U.S. has begun deployment of hundreds of sea-launched cruise missiles (SLCMs), and the Soviets are following suit. If unconstrained by arms control, these Soviet SLCMs will provide an excellent counter to a U.S. BMD system, no matter how effective such a system is against Soviet ballistic missiles.[7] Indeed, the Soviets have a distinct geographical advantage in deploying SLCMs, because of our country's long coastlines and the fact that the majority of our population lives along these coasts. A BMD system and other

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

types of strategic defenses cannot hope to begin reducing the nuclear threat unless constraints are placed on the production and deployment of SLCMs and other types of cruise missiles, despite the verification problems such constraints will pose for arms control.

An even more immediate problem concerns the continued viability of the 1972 ABM treaty and the consequences that a breakdown of the treaty would pose for arms control in general. Administration officials continue to maintain that SDI research efforts are fully consistent with the ABM treaty,[8] but in the period since the SDI was established in 1984, projected tests of BMD components that could violate the treaty have been increasingly moved up. Space-testing of BMD pointing and tracking equipment is now set for 1987, while other tests are planned in the near future for SDI lasers, kinetic energy projectiles, and surveillance equipment. The Defense Department has maintained that these tests will not violate ABM treaty provisions, but this rationale is based on the fact that the tests will be conducted against anti-satellite interceptors, not ballistic missiles, and that the power requirements used will not be sufficient for an actual BMD system.[9] Whether or not such arguments represent "creative lawyering," as some critics maintain, the fact remains that encroaching on the ABM treaty is hardly likely to be conducive to negotiating reductions in offensive nuclear forces.[10]

Until such time as the U.S. and Soviet Union have jointly agreed on how to achieve deterrence based on defenses, it makes little sense to call into question the viability of existing arms-control agreements. Senior administration officials, however, have openly questioned both the existing SALT II limits and the ABM treaty.[11] In contrast, President Reagan's Commission on Strategic Forces (the Snowcroft Commission) has stressed the importance of the ABM treaty, noting in its 1984 report that "the strategic implications of ballistic missile defense and the criticality of the ABM treaty to further arms control agreements dictate extreme caution in proceeding to engineering development in this sensitive area. . . ."[12]

There are a number of other political risks in expanding the SDI program as quickly as the administration proposes. The claim is made that SDI research is needed as a hedge against possible Soviet technological breakthroughs, and to provide future presidents with greater options in the field of strategic defenses. The first argument is true only up to a point. Research in weapons technologies, sensing

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

and optical systems, and computer processing is needed both to determine their feasibility for a variety of military applications—not just BMD—and to keep abreast of possible Soviet discoveries. A rapidly expanding SDI program, however, the cost for which is projected to total over $60 billion through 1993, is neither a rational nor a cost-effective method of conducting this research. It is even questionable whether the program can effectively utilize the large increases in funding requested by the administration. Former Defense Secretary James Schlesinger has testified before Congress that annual increases of 35 percent for military R&D programs stretch the limits of what can usefully be spent,[13] yet funds for the SDI are projected to increase by 160 percent between fiscal years 1985 and 1986.

The rapid acceleration of the SDI program, and its focus on systems that will not be deployable for another ten to fifteen years at least, also call into question the president's stated rationale of providing options for future presidents. If increases in SDI funding and organizational momentum continue, the accelerating pace of the program could well foreclose options for the next administration, both politically and militarily. For example, many administration spokesmen see the SDI as necessary insurance against a possible Soviet breakout of the ABM treaty. Yet one of the differences between the SDI program and U.S. BMD efforts prior to 1984 is a reduced emphasis on currently available technologies for terminal defense being developed by the U.S. Army. It is these systems, and not space-based BMD systems that are years away, that would prove beneficial should the Soviet Union seek to gain a strategic advantage by rapidly deploying a nationwide defense system.

Supporters of the SDI maintain that, given the greater economic strength of the U.S., we will be in a better position to compete with the USSR on what will assuredly be very expensive weapons systems. The notion of exerting economic leverage on the Soviets in the military sphere is appealing, but the argument cuts both ways. While the American economy is much stronger than that of the Soviet Union, the Soviets do not face comparable domestic constraints in allocating resources. The combination of mounting federal deficits, increased defense budgets, and reductions in social services could well lead to domestic and Congressional resistance to spending large sums on strategic defenses of unproven effectiveness. While the Soviet leadership may be faced in the years ahead with economic constraints

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

regarding its military programs, there is little doubt that the USSR will invest whatever is necessary to ensure the deterrent capabilities of its nuclear forces.

In addition to complicating U.S.-Soviet relations and arms-control efforts, the administration's handling of the SDI has also created uncertainty and apprehensions among America's allies in Europe and the Pacific. In his 1983 speech, President Reagan emphasized the importance of U.S. commitments to our allies, noting that their safety and ours are one. Despite such assurances, it was inevitable that a significant new policy direction by the U.S. would raise questions among our allies, particularly as this policy involves major changes in the military-strategic area. It is not surprising that the long-term goal of deploying defenses has aroused both apprehensions and support. Britain and France are concerned about the utility of their own nuclear arsenals, should the Soviet Union respond to the U.S. initiative by developing and deploying defenses of its own. Some Europeans have expressed concern about a possible U.S. return to a "fortress America" concept, should defenses prove more valuable for the U.S. than for Europe. Still others have welcomed an initiative whose stated objective is to free the world from the threat of nuclear war.

The SDI program itself is probably not yet fully understood abroad, but there appears to be general approval among our allies (as among Americans) that research on new technologies for defense should be carried out, especially since the Soviets are similarly conducting BMD research. Few of our allies, though, have agreed to take the next step of actively participating in SDI research, even though they could benefit economically and technologically from such participation.[14]

The major apprehension that is voiced by many of our allies is that the new U.S. initiatives will not lead to arms reductions and a mutual U.S.-Soviet exploration of strategic defenses, but rather to still further deterioration in East-West relations. In this view, serious U.S.-Soviet negotiations for major reductions in nuclear armaments will become difficult—perhaps impossible—if the U.S. is unilaterally working to develop a strong defense against Soviet nuclear weapons with an explicit goal of achieving a total defense against them. Skeptics of the SDI envision a difficult transition period leading to a more polarized and less stable world, and to diminished security for the U.S., the Soviets, and the allies. Both supporters and skeptics maintain that

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

real progress toward enhanced stability and security will not be attained through unilateral efforts, but must involve joint negotiations and agreements, whether they be for arms reduction, mutual and parallel defense buildup, or both.

STRATEGIC DEFENSES AND MUTUAL SECURITY

That the problem of avoiding nuclear war is one that the U.S. and Soviet Union share is recognized by the Reagan administration and its advisors. The Secretary of Defense, in an article on the SDI, refers to "our new approach, stressing defensive measures for mutual survival. . . ."[15] Yet during the first round of the Geneva talks between the U.S. and Soviet Union in the spring of 1985, the U.S. firmly resisted any notion of limiting the SDI program. It remains to be seen whether the administration can, or even intends to, use the SDI as bargaining leverage to gain substantial results in Geneva. At some point, there will have to be agreement with the Soviets on how strategic defenses might enhance the security of both countries. The prospect of an increased level of arms competition involving both offensive and defensive weapons cannot be acceptable to either nation.

Who would have predicted in the early 1950s, when both nations had nuclear weapons and relations between them were chilly indeed, that in only a few years the two countries would be seriously involved in arms-control negotiations, and that these negotiations would lead to some twenty formal agreements and treaties, almost all designed to decrease the risk of war? The basic reason for this surprising level of joint effort was cogently described recently by Dean Rusk, secretary of state to Presidents Kennedy and Johnson, when he remarked that "there is a special feature about our relations with the Soviet Union. We, and they, are the only two nations in the world who, if locked in mortal combat, can raise serious questions about whether this planet can any longer sustain the human race. We, and they, share a massive, common responsibility. That is the prevention of all-out nuclear war. They know that; we know that."[16]

With this common recognition of their joint responsibilities and concerns—concerns validated by the many years of arms-control negotiations—it is impossible to believe that the United States and Soviet Union will not eventually include the possible role and possible

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

control of defensive weapons in their discussions of arms limitations and reductions. How much more preferable to confront this issue promptly, before strong momentum toward deployment of defensive weapons diminishes the scope of any possible agreement, or even makes agreement impossible.

While it may be too soon to negotiate direct controls on the new BMD technologies, there are important related issues that have been raised in previous U.S.-Soviet discussions and negotiations. Prompt negotiation in some of these areas could renew the sense of joint responsibility and pave the way to broader and more substantive arms reductions and limitations. What is desperately needed at this juncture is a more profound recognition by both nations that if they are to escape the terrible dilemma that nuclear weapons have engendered, it must be by joint action. Recognition of this fact could lead to both mutual agreements and the realization that there are significant measures for promoting stability that each nation can take by itself. The following suggestions point to several mutually useful and significant arms-control measures for which there is much precedent and where agreements on specific measures might be rapidly obtainable.

One way the U.S. by itself can improve opportunities for mutual agreements is to exercise restraint on SDI funding. The current FY 1985 budget for SDI is $1.4 billion. The Defense Department's request for FY 1986 is $3.7 billion. A desirable step would be for the U.S. Congress to hold the budget increase for FY 1986 to not much over the current $1.4 billion. As an example of how the SDI program could be restructured, Senators Dale Bumpers, John Chafee, Charles Mathias, and William Proxmire introduced an alternative SDI budget of $1.86 billion for FY 1986. This budget would increase basic BMD research by 30 percent, but would limit funding for those SDI demonstration projects that could impinge on the ABM treaty.[17] This type of BMD program would allow the U.S. to explore the military feasibility of new technologies and keep abreast of Soviet BMD work, while avoiding the political complications of a greatly accelerated SDI effort.

In considering joint negotiations, there are at least two relevant areas where negotiations between the superpowers could be entered into promptly. One is updating and improving the 1972 ABM treaty. The other is negotiating a treaty that bans anti-satellite (ASAT)

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

weapons, or at least prohibits further testing of them; this would effectively limit development and deployment of useful ASAT systems.

For more than a decade, the ABM treaty has been an effective agreement in promoting stability between the U.S. and Soviet Union. At present, there are serious allegations that the Soviets are violating the agreement with the construction of the Krasnoyarsk phased-array radar in Siberia. In addition, the Soviets have accused the U.S. of certain treaty violations, and there are a number of gray area issues that need to be resolved if the treaty is to remain viable.

In the end, however, none of these issues is so militarily significant that the security of the U.S. would be improved by withdrawing from the treaty. Instead, both countries should work to clear up those areas of ambiguity that have arisen over the years. ABM treaty provisions and SCC consultation procedures could be strengthened with respect to: the building of new phased-array radars, anti-tactical ballistic missile (ATBM) systems, the dividing line between BMD research and development, stricter definitions of what constitutes a BMD component, and the testing of BMD components under an ASAT rubric.[18] Until the prospects of a survivable and cost-effective defense against nuclear weapons become much clearer, it should be in the interests of both nations to maintain as effective an ABM treaty as possible.

It should also be in the interests of both nations to negotiate a treaty that would inhibit the development of ASAT systems by either party. This possibility was the subject of U.S.-Soviet arms-control talks in 1978–79, and drafts of possible treaties have been presented by the Soviet Union. While the ASAT issue has since been complicated by the attention recently given new BMD technologies, the fact is that an unrestrained ASAT competition between the U.S and Soviet Union would preclude any hope of strategic defenses increasing our security.

If both countries are going to commit themselves to eliminating the threat of nuclear weapons, they will need to engage in a long-term cooperative effort involving substantial arms reductions as well as joint consideration of defensive systems. Even with such unprecedented cooperation, it might well take two decades or more before the threat of nuclear destruction is minimal or absent. The buildup to the present immense stockpiles of nuclear weapons has taken over three decades, and the process of reversing this trend will not be achieved quickly. But the essential first step is to begin the reversal.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

If the U.S. persists unilaterally in working towards a reliance on defensive forces against nuclear weapons, it will face the prospect of determined Soviet opposition. The transition period of moving from offensive deterrence to a defense-dominant posture will be long and will be filled with political and technical uncertainties. The objective of even very good defenses will surely remain unattainable. Even if some of the projected new technologies become feasible and prove to be militarily attractive, their deployment will contribute little to strategic stability if they are introduced in an environment where arms-control limitations are absent, both countries are expanding their offensive nuclear forces, and political relations are dominated by mutual suspicion that the other country is seeking to gain a unilateral strategic advantage.

ENDNOTES

[1]Paul Nitze, "On the Road to a More Stable Peace," speech delivered to the Philadelphia World Affairs Council, Feb. 20, 1985, p. 4.

[2]*Aviation Week & Space Technology,* April 29, 1985, p. 225.

[3]For an account of events leading up to the March 23 speech, see "Reagan's 'Star Wars' Bid: Many Ideas Converging," *New York Times,* March 4, 1985, p. 1.

[4]Deputy National Security Advisor Robert McFarlane was reportedly especially influential in convincing President Reagan that a strategic defense program might attract bipartisan support in the U.S. and be a useful lever in arms-control negotiations. See "Reagan Seized Idea Shelved in '80 Race," *Washington Post,* March 3, 1985, p. 1.

[5]See Raymond Garthoff, "BMD and East-West Relations," in Ashton B. Carter and David N. Schwartz, eds., *Ballistic Missile Defense* (Washington, D.C.: The Brookings Institution, 1984).

[6]Nitze, op. cit., p. 5.

[7]See "Banquet Address: The Honorable James R. Schlesinger," given at the *National Security Issues Symposium 1984: Space National Security, and C³I,* Oct. 25, 1984 (Bedford, Mass.: The MITRE Corporation), p. 57.

[8]In January 1985, Secretary of State George Schultz maintained that "no decisions to go beyond (SDI) research have been made nor could they be made for several years." See "Excerpts from Schultz's News Conference About Arms Talks," *New York Times,* Jan. 9, 1985, p. A10.

[9]See the appendix entitled "Compliance of the Strategic Defense Initiative with the ABM Treaty" that was attached to the Defense Department "Report to the Congress on the Strategic Defense Initiative" (Washington, D.C.: Department of Defense, 1985).

[10]Paul Warnke, chief U.S. negotiator during the SALT II talks, called the Defense Department's justification of the SDI tests "a total fraud," adding that "if this were a Soviet report, we would decide there was no reason to continue

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

negotiating with them. . . ." See "U.S. Changing 'Star Wars' Test Plan," *Boston Globe,* April 21, 1985, p. 18.

[11]In May 1985, Richard Perle, assistant secretary of defense, said that the U.S. should break out of the SALT II limits on offensive forces in September 1985, when a new Trident submarine goes to sea. See "Arms aide: U.S. should let SALT II lapse," *Boston Globe*, May 8, 1985, p. 8. Secretary of Defense Weinberger has openly questioned the utility of the ABM treaty—for example, on the NBC television program, "The Real 'Star Wars': Defense in Space," aired Sept. 8, 1984; text reprinted in *Current News: Special Edition,* Oct. 25, 1984 (Washington, D.C.: Department of Defense), pp. 26–30.

[12]*Final Report, President's Commission on Strategic Forces*, March 21, 1984 (Washington, D.C.: The White House), pp. 7–8.

[13]See "SDI Director Defends Rise in Research Funds," *Washington Post,* March 20, 1985, p. A12.

[14]At the 1985 Economic Summit in Bonn, European resistance to the SDI was led by President Mitterand of France, who proposed instead that the Europeans should cooperate in a civilian space science program called Eureka. See "Mitterand's Goals: 'Preserving Skills,' 'Protecting Europe' " *New York Times,* May 6, 1985, p. A13.

[15]Caspar W. Weinberger, "The Strategic Defense Initiative," *Harvard International Review,* Jan.-Feb. 1985, p. 7.

[16]"Perspectives on Power: An Interview with Dean Rusk," *East-West Outlook,* March 1985 (Washington, D.C.: American Committee on East-West Accord), p. 4.

[17]"Senators Propose Alternative SDI Budget," *Military Space,* April 15, 1985, p. 1.

[18]See Thomas K. Longstreth, John E. Pike, and John B. Rhinelander, *The Impact of U.S. and Soviet Ballistic Missile Defense Programs on the ABM Treaty,* a report for the National Campaign to Save the ABM Treaty (Washington, D.C.: 1985).

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Hans A. Bethe and Richard L. Garwin

Appendix A: New BMD Technologies

A VARIETY OF TECHNICAL MEANS are available or under consideration for defense against nuclear-armed ballistic missiles in flight. Some of the technologies for attacking the missiles as they approach the U.S. and head for their targets have been under study since the 1960s and are fairly mature. Other technologies, especially those for attacking ICBMs and SLBMs in the early stages of flight, are only now undergoing research and planning, and their eventual utility is quite uncertain. A layman's guide to these technologies can be found on pages 53 through 71.

There are important advantages to destroying ICBMs and SLBMs in their initial launch phase before they have released their "payload" of reentry vehicles (RVs) that carry the nuclear weapons. It is almost mandatory that attack in this initial phase be from space-orbiting satellites that overfly the launch sites. This requirement is the main driving force for the new types of weapons that would operate from space. Our emphasis on the technology of such weapons should not obscure the crucial problem of ensuring the survival of the defense itself.

The offensive nuclear weapons systems of the two superpowers are formidable (roughly ten thousand deliverable nuclear warheads on each side), and it can be assumed that either nation will move to maintain an effective offensive capability if the other deploys defense systems. The offense can take countermeasures designed to weaken or defeat the various components of any defensive system. In many cases, these may be less expensive and more readily implemented than the defensive system itself. Given the diversity of offensive and defensive measures and responses, it becomes important to have at

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

least an approximate notion of the comparative costs of defense systems and the possible countermeasures the offense may undertake. It is apparent that the cost of frustrating perfect or near-perfect defense is less than that of denying the goals of a less ambitious defense of similar technology. Fast-burn ICBMs are particularly useful in augmenting the offensive force as their boosters burn out at an altitude of 80 kilometers, in 50 seconds, totally negating several types of weapons for boost-phase intercept and increasing the performance required by those systems that still have some effectiveness.

This appendix confines itself to analyses of defense against ballistic missiles and offensive countermeasures, but there are other ways of delivering nuclear weapons—long-range cruise missiles and bombers being the most obvious. A complete defensive system will, of course, also need to deploy defenses against these. The large number of Soviet ICBMs, their capability for simultaneous launch, and the possible clustering together of future ICBM deployments provide a generally more difficult problem than that posed by long-range SLBMs. For that reason, most of our discussion deals with ICBMs, although short-range SLBMs—particularly those launched on "depressed trajectory"—pose special problems.

The major portion of this appendix focuses on an analysis of a comparatively new class of weapons, directed energy weapons (DEWs), for which the kill mechanism is a beam of light or of particles that travel at nearly the speed of light. This emphasis is perhaps misleading, since these weapons are for the most part only in the very early research stage of evolution, and one cannot speak with confidence even of their feasibility, let alone their characteristics. They are emphasized because they are a new mode of defense with exceedingly short response times, and the use of such defensive weapons seems essential if substantial numbers of offensive ballistic missiles are to be destroyed in their initial launch phases.

DIRECTED ENERGY WEAPONS

Types of Weapons Considered

More than a decade ago, it was proposed that a defense against ICBMs and SLBMs might best be based on the use of directed energy

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

beams or particles. Traveling at or near the velocity of light, such beams or particles would traverse outer space essentially unhindered. Offensive missiles could travel only a short distance before being attacked by weapons moving at such great speed. This would be a great improvement over previous ABM systems, whose chemically propelled missiles did not move as fast as their targets.

Five different types of directed energy weapons have been proposed. Four would employ lasers; the fifth, particle beams. Hydrogen and fluorine could be combined to lase with the emission of light in the infrared range, with a wavelength of about 2.7 micrometers. Excimer lasers produce light in the ultraviolet range, with a much shorter wavelength. The beam of light from either of these lasers, if focused on the skin of an ICBM booster by one or more large mirrors deployed in space, could heat a spot about one meter in diameter, causing it to melt or evaporate and leading to gross failure of the booster.

In a free-electron laser (FEL), beams of arbitrary wavelength, including that of visible light, would be extracted from a powerful beam of high-energy electrons. This technique is very much in its infancy, so that neither its performance nor its cost can be estimated. While high efficiency may be achievable, it is not yet known how multi-megawatt optical powers can be handled on the small mirrors that FELs will apparently use. Because of the preliminary state of the technology, and because most of the systems questions will be illustrated in our discussion of the excimer laser, we shall not discuss the FEL further here.

An X-ray laser would be powered by a nuclear explosion that would strongly illuminate a material surrounding the explosive, leading to the propagation of a laser beam along "wires" embedded in the material. X-ray lasers could deliver a heavy jolt to an ICBM booster, damaging its internal mechanisms.

A beam of atomic particles accelerated to high velocity could damage the electronics of an ICBM booster by penetrating deeply. Neutral hydrogen atoms could be used for this purpose to avoid deflection by the magnetic field of the earth, which would affect beams of charged particles.

Possible Missions for DEWs

Space would be used in many ways in ballistic missile defense (BMD). First, the early-warning satellites would detect possible ICBM or

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

SLBM launches by the enemy. Second, one or more battle-management stations would track and assess each of the launched missiles and assign it to a specific BMD device. These battle-management stations would have to be able to keep in view both the ICBM silos and the BMD devices; it would therefore be best for them to be deployed in geosynchronous orbit (GEO). They would also have to be equipped with computers far beyond the present state of the art. Third, there would be the BMD weapons themselves: they could be either permanently stationed in orbit, or launched ("popped up") only when needed. The pop-up weapons, assumed invulnerable before launch, raise starkly the problem of use of such systems to augment a first-strike offensive force. It is hoped that with their tremendous speed these weapons would be able to reach and kill offensive missiles in the first phase of their flight, the so-called boost phase that occurs between launch and the end of booster acceleration. Such capability would greatly enhance the leverage of the defense. It would be far easier, for instance, to track an ICBM in boost phase than in later parts of its trajectory, because the booster flame is discernible at great distances, especially in the infrared. Also, the booster skin is relatively thin and weak and hence more vulnerable than the reentry vehicles the booster will deploy. Finally, there are fewer boosters than reentry vehicles, and they are more difficult and costly to simulate or "decoy."

All the directed energy weapons mentioned here could theoretically be effective in boost phase against the current generation of liquid-fueled ICBMs, whose boost phases last 200 to 400 seconds and reach altitudes of 400 kilometers. However, the duration of flight and final altitude of ICBM boosters are likely to decrease as new weapons are developed in response to the threat of boost-phase intercept. Already the MX, under development in the U.S., has reduced the boost phase to some 180 seconds duration and 200 kilometers altitude. Contractor studies for the Fletcher panel indicate that further reductions to as little as 40 seconds and 80 kilometers can readily be achieved. In that case, only ultraviolet (UV) and infrared (IR) beams will be useful for boost-phase defense. X-rays and particle beams cannot easily penetrate the earth's atmosphere. They would therefore be useless against boosters that burn out at low altitudes (under 110 kilometers for X-rays; under 140 kilometers for particle beams).

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Both X-rays and particle beams do, however, have potential for use in the post-boost phase, after the acceleration stages have been discarded but before the booster "bus" has released all its reentry vehicles (RVs) and decoys. This phase now lasts approximately 300 seconds and takes the bus to altitudes of about 600 kilometers—well above the atmosphere.

The next phase—the mid-course—of an ICBM's flight will occupy some 15 to 20 minutes, during which the warheads, accompanied by decoys, travel through space toward their targets. Despite the comparative length of this period, mid-course interception presents formidable problems for the defense because of the enormous number of objects deployed and the weakness of any RV infrared signals that might aid in discrimination and tracking. Mid-course behavior will not be changed by fast-burn boosters or by the absence of a bus.

Directed energy weapons have little potential for use in the terminal phase when warheads reenter the atmosphere and approach their targets.

Possible Basing Modes

The principal attraction of directed energy weapons purportedly comes from their ability to "reach back" further in missile flight than was possible with the older technologies, attacking enemy missiles before they have released their warheads and when they are most vulnerable. The curvature of the earth and the fact that the ICBMs would rise no more than 400 kilometers above the Soviet Union during boost phase would allow a clear shot only from space.

This section reviews alternative ways of placing the directed energy weapons in space. These include stationing the weapons permanently in space aboard satellites in either low earth or geosynchronous orbits, launching them from the ground ("pop-up") when an attack is observed, or directing their beams from the ground to mirrors in space.

It is relatively easy to deploy a satellite into low earth orbit (LEO). Since 1957, this has been done by rockets similar to or identical with those that launch ICBM warheads. It can also be done by a space shuttle. A shuttle flight could carry about 30 tons into an eastward near-equatorial orbit, at a few-hundred-kilometer altitude, and about half that weight into a polar LEO. The cost would be about

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

$3 million per ton for the eastward LEO and about $6 million per ton for low polar orbit.

The basic drawback of deployment in LEO is the so-called "absentee problem." A satellite in LEO orbits the earth every 1.5 to 2 hours. Since the earth rotates, the satellite will be over a different part of the earth on each successive orbit. Any given satellite would therefore be near the intended target only a small fraction of the time. A large number would have to be in orbit to ensure that there is always one near the target. We can estimate the number of satellites that will be absent (not near the target at any time) as follows: at present, the Soviet ICBMs are distributed in a band about L = 5000 km in length along the Trans-Siberian railroad at latitude $\simeq 57°$, with some extension to the northwest at the western end. Let R be the "kill radius" of a laser satellite, i.e., the distance at which it could destroy an ICBM booster, and assume the satellites are in circular polar orbits at an altitude A from which a laser can see the earth's surface at a distance R (the horizon). Then the fraction of satellites that are within a distance R from the nearest point on the latitude circle of 57° would be $f_1 = 2R/\pi R_o$, where $R_o = 6370$ km, the radius of the earth. The circle of constant latitude λ would have a length of $2\pi R_o \cos\lambda$. Lasers at latitude λ could attack ICBM boosters if they were located within an arc of length L + 2R. Lasers south or north of that latitude would have a somewhat smaller effective arc, but this would be made up partly by some lasers above the northwest extension of the band of ICBMs. Thus we expect that the fraction of orbiting lasers that could be effective would be $f = (2R/\pi R_o)\ (L+2R)/(2\pi R_o \cos\lambda)$. For every laser that could be effective, we would have to put $N = 1/f$ laser satellites into orbit. Setting R = 3000 km, for which A = 670 km, we find N = 6.6. This result seems to agree with more detailed calculations. Of the N satellites, N-1 would be "absentees" at any one time. We call N the absentee ratio. Of course, it does very little good to deploy lasers at high altitude A in order to obtain a low absentee ratio N, if the lasers cannot destroy the many boosters they can now see.

It would be desirable to make the absentee ratio small, but to do that by increasing laser *power* and altitude would have the offsetting disadvantage that more fuel would have to be carried into orbit for each satellite in order to attack at maximum range. In fact, to attack ICBMs spread over a region, the possibility of assigning a booster to

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the closest laser would lead one to lasers of lesser capability, lower altitude, and *higher* absentee ratio—although if mirror size were cost-free, one would always prefer the largest mirror. The absentee problem of low earth orbit can be overcome by deploying the lasers in geosynchronous orbit, i.e., in such a way that they take precisely 24 hours to circle the earth. They would be above the equator and would see the same region of the earth at all times. However, even though the laser in GEO might have the Soviet silos always in view, it would be roughly 40,000 kilometers from the target.[1] To obtain a beam small enough in diameter from such an enormous distance would require optical instruments of unprecedented size and performance. It would require about four times as much energy to lift a given weight into GEO as into LEO.

One suggestion on how to overcome the weight problem is to place the very heavy excimer lasers on the ground and beam their rays up through the atmosphere to a large mirror in GEO, which in turn might be assisted by tracking satellites and auxiliary relay mirrors in LEO. As we will discuss later in this appendix, however, such an arrangement would itself encounter formidable problems, e.g., vulnerability of the mirrors, electric power requirements, and disturbance by cloud cover and other atmospheric phenomena.

An additional possibility is to "pop up" lasers when an enemy attack is detected. This would reduce the vulnerability and much of the cost involved in deploying satellites permanently in orbit. Because of weight considerations, pop-up deployment is not a basing option for IR or UV lasers; it could be considered only with very lightweight weapons such as X-ray lasers.

A prime difficulty with the pop-up scheme is that of gaining a line of sight to the Soviet ICBM while it is still in its boost phase. To accomplish this, the lasers would have to be launched from a point nearer the Soviet ICBM fields than the American continent. This would require launching from submarines in the Indian Ocean or some Arctic seas. Even from these points, ability to sight the target in time would depend on the burn-out speed and altitude of Soviet boosters. If the Soviets make significant improvements in these regards, it is doubtful that the pop-up scheme would be viable for attacking their ICBMs. It might still be usable, however, against SLBMs.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Performance Requirements

The Fletcher panel concluded that ICBM boosters would be likely to suffer severe damage if exposed to an energy flux of 200 MJ/m^2 (megajoules per square meter) from a chemical (IR or UV) laser. For a 1 m^2 spot, this would be the energy equivalent of about 100 pounds of TNT, which on earth would cost about $100. In space, and delivered by a laser, the cost of this amount of energy would be immensely greater.

For X-ray lasers, the energy flux required would be somewhat smaller, perhaps 100 MJ/m^2. For particle beams, the requirement might be considerably less under special conditions, perhaps 0.1 MJ/m^2 for destroying electronic components.

To gain some sense of how difficult it may be to achieve the damage level contemplated by the Fletcher panel, we should consider what would be involved in focusing a laser beam on a booster so as to incapacitate it. To begin with, the beam would have to be concentrated on a spot on the ICBM booster with a diameter of about one meter. Moreover, the laser would have to dwell on the target for several seconds, during which time the booster would move many kilometers. To keep such a small spot stationary on the booster would pose a tremendous challenge for the pointing and tracking equipment, especially as the booster would be about 10 meters ahead of the flame that it generates. The configuration of plume and booster would have to be very well known beforehand to permit finding a given spot on the booster to one meter accuracy. In addition, the tracking would have to be extremely accurate, since in the time required for the light to pass from laser to ICBM—about 0.01 seconds for an infrared laser in LEO—the booster would have moved several tens of meters.

We would also need to face the fact that the needed beam diameter (and hence energy density) can be obtained only when the laser is within a certain maximum distance from the target. Because of the wave nature of light, every laser beam has a minimum angular spread of $\alpha = (4\lambda)/\pi d$, where λ is the wavelength of the light, and d the diameter of the mirror. A beam with spread α is called "diffraction limited"; practical laser beams may have a wider spread. A precise derivation of the maximum power density at any point in a diffraction-limited beam gives the result that the maximum power

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

density within a focused laser spot is $(\pi/4)P(d^2/\lambda^2R^2)$. This *limit* on power density is the laser power divided by $(\pi/4)S^2$, giving a precise meaning to the concept of spot diameter S. In conventional terms, the power density at range R cannot exceed B/R^2, with B the "brightness" of the laser, which we have here calculated as $B = PA/\lambda^2$, with A the (projected) area of the (uniformly illuminated) mirror. Therefore, if we wish the beam to form a spot of diameter $S = \alpha R = (4/\pi)(\lambda/d)R$, the laser can at most be at a distance $R = S/\alpha = (\pi d/4\lambda)S = 0.8\ Sd/\lambda$.

In the above example, we assumed that the mirror can have a diameter of 10 meters. We can appreciate the difficulty of achieving such a size if we consider that the largest operating astronomical mirror, that of the Palomar Observatory, has a diameter of only 5 meters; that it took years to build; and that many corrections were needed before it had the required quality. A larger astronomical mirror with a diameter of perhaps 10 meters is planned for the future but will probably take at least four years to build. The Hubble Space Telescope planned for space operation in 1986 will have a diameter of only 2.4 meters and is expected to cost some $1.2 billion.

Note also that we have postulated that the beam spot on the target would be much smaller than the mirror. Thus it would not be enough to focus the laser to infinity; it would have to be focused to the approximate distance of the target.

From the foregoing, one can conclude that the performance requirements we have postulated for directed energy weapons are formidable indeed. There is no assurance at this time that their achievement is technically feasible. Nevertheless, the uncertainty in technical feasibility is dwarfed by the difficulty in ensuring the survival of the defense and its economic competitiveness with augmentation of the offense—the twin criteria set by Paul H. Nitze that the defense be survivable, and that it be "cost-effective at the margin."

ALTERNATIVE DEWS AND THEIR BASING MODES

Infrared Chemical Lasers

The preferred infrared chemical laser is hydrogen fluoride (HF), which emits radiation with a wavelength of about 2.7 micrometers. Such lasers could be placed in satellites circling the earth at an altitude

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

of perhaps 1000 kilometers. If there were a Soviet ICBM launch, it would be observed by the early-warning satellite, which would transmit this information to the battle management satellite. The latter would then select one of the chemical lasers and command it to direct its beam against a Soviet booster. The laser beam would heat a spot perhaps 0.3–1.0 meter in diameter on the booster skin, and make it melt or evaporate; this would lead to gross failure of the booster.

IR lasers can only work satisfactorily from low earth orbit. With the HF laser of wave length $\lambda = 2.7$ μm, and taking a mirror d = 10 m and requiring a spot size s = 1 m, we find that the maximum distance from laser to target is R ≃ 3000 km—the "kill radius." (The distance to target from a satellite in GEO, as calculated earlier, would be nearly 40,000 kilometers; clearly, an IR laser could not usefully be deployed in GEO.) For a target at this distance to be visible from the satellite, the latter must be at an altitude of at least 670 kilometers. As we have indicated, for every satellite viewing the target, there would be several absentees. For our kill radius the formula gives the absentee ratio as 6.6.

Aviation Week & Space Technology (*AW&ST*) has published an abstract of the conclusions of the Fletcher panel. It includes an artist's conception of an HF laser of 25 megawatts; this is far beyond the present state of the art. A more detailed fantasy of this same laser is to be found in the October 1984 *Scientific American*.[2] A spot of one meter diameter, which we assumed above, has an area of not quite a square meter, so that we would need not quite 200 megajoules (MJ) to destroy the target. Because of the unavoidable imperfections of optical focusing, and the fact that our derivation obtained this power density only at a single point, we shall assume a requirement of 250 MJ. A laser of 25 MW power would then need to dwell on the target for 10 seconds to destroy it.

Some of the laser satellites might be closer to the target than 3000 kilometers—"the kill radius"—so that under ideal conditions the laser could focus a smaller spot S on the target, and need less time to destroy it. Under ideal conditions, the average dwell time of this laser on its target might be only 5 seconds. This, of course, assumes that the battle management computer is near-perfect in assigning lasers to targets.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The report in *AW&T* also postulates (arbitrarily) that the laser should have fuel for 100 seconds. It would then be able to destroy 20 ICBMs if it was in sight of the Soviet ICBM field. Using the absentee ratio we have calculated (N = 6.6), we find that to target each Soviet ICBM we would need to deploy 0.33 laser satellites. For the 1400 Soviet ICBMs now existing, this would mean a total of 460 laser satellites in orbits about 1000 kilometers high.

The number of laser satellites needed might be slightly diminished by aiming for a laser spot on the booster of the smaller diameter S. The price for this reduction in the number of satellites, however, would be an increase in the difficulty of aiming and pointing the laser at the target. However, Gregory Canavan of Los Alamos and Christopher Cunningham of Livermore have proposed moving in this direction.[3] Cunningham calculates that lasers deployed at 300-km altitude can destroy more than 2 boosters per second. But once the dwell time of the laser on this target gets this short (42 milliseconds for some of Cunningham's engagements with boosters at 200-km altitude), it is essential to consider the time required for the laser mirror to slew from one target to another. For guidance, we note that the space telescope, with a mirror of 2.4-meter diameter, takes 3 seconds to move by 0.02 arc-seconds and then stabilize. Of course, that telescope is not designed for fast motion, but it seems excessively optimistic to believe that the 10-meter mirrors assumed for the BMD lasers could be stabilized in as little as one second, after moving through several degrees of arc.

Clearly, many factors need to be considered in estimating the number of satellites required.[4]

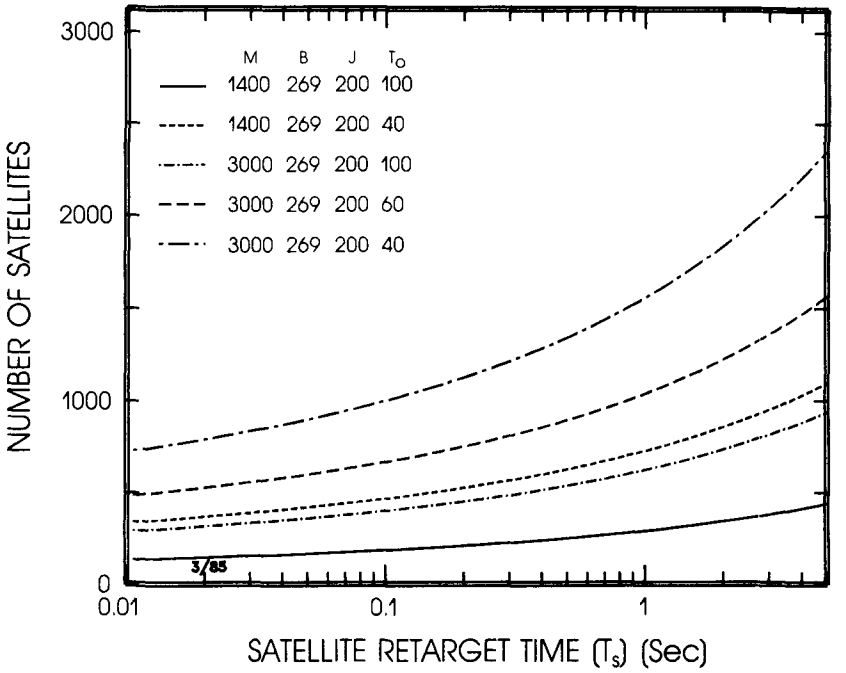
We will now sketch the result of an analytical derivation of the number of satellites needed for targeting Soviet ICBMs (See figure 1, next page). For M boosters clustered in a region of diameter h or less (h the altitude of the satellite constellation), the required satellite *density* s (in satellites per square megameter) is given by

$$M = (\pi s B T_0/J) \ln[1 + E(BT_S/J)^{-1/2}]$$

where B is satellite brightness (units of 10^{18} watts per steradian), T_0 the boost time of the boosters (engagement time), J the booster hardness (megajoules per square meter), E the radius of the earth, and T_S the retarget time. The result holds for the optimum satellite altitude $h = (BT_S/J)^{1/2}$. B cannot exceed PA/λ^2, with P the laser power, A the area of the laser mirror, λ the wavelength, on the assumption

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Fig. 1 Dependence of satellite numbers on booster numbers (M), hardness (J), boost-time (T_o), and satellite brightness (B)



The number of our standard laser satellites is plotted against assumed laser retarget time for two assumed booster numbers and three assumed engagement times during boost phase. Against the clustered launch of 3000 boosters of 40-sec engagement time, 1344 satellites of 0.5-sec retarget time in optimum orbit are required, working perfectly reliably, to dispatch the boosters.

that the laser is focused at the distance of the target. For P = 25 megawatts, and for a mirror diameter of 10 meters and a wavelength 2.7 micrometers, B = 2.69 x 10^{20} W/steradian.

The *number* of satellites needed is minimized by choosing an orbit of inclination i equal to the latitude of the northernmost silo, assuming the silos uniformly distributed between latitudes λ_1 and λ_2. The required number of satellites is $N = 4\pi sE^2/y$, with the concentration factor y = 3.1 for silos distributed between 50° and 60° north. This approach does not use the vague "absentee factor" N, but for clustered launch gives $N = (4\pi E^2)/(\pi y H^2)$, with H the distance from laser to horizon. For T_S = 0.5 sec, h = 820 km and $H \equiv [(E + h)^2 - E^2]^{1/2}$ = 3.3 Mm. Thus, N = 4.72. For T_S = 0.1 sec, h = 370 km and H = 2.20 Mm and N = 10.8. For 3000 boosters of T_0 = 40 sec and hardness J = 200 MJ/m^2, clustered in a region of diameter less than

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

h, the number of laser battle stations in optimum orbit required to overcome them is 2044 if a retarget time $T_S = 3$ sec can be achieved; 1003 with the SDI goal of 0.1 sec.

Although the above "absentee factor" was computed for Soviet ICBM launch sites, IR chemical lasers would also be able to take care of Soviet SLBMs. Since these would be in locations different from the ICBMs, different lasers would be engaged. Figure 1 shows the dependence of satellite numbers on booster numbers, hardness, burn time, and on satellite retarget time.

It is difficult to estimate the cost of infrared satellites. An absolute *minimum* might be deduced from their weight (although the cost of a pair of binoculars or of a fine mechanical watch bears no relation to its weight). Some 500 joules of energy per gram of fuel may be achieved in an HF laser. If the satellites are to operate for 100 seconds with an output of 25 megawatts of laser light, the fuel must be sufficient to produce 2500 megajoules. Accordingly, the weight of the fuel would be 5 tons. The satellite must weigh at least twice as much as the fuel, or 10 tons. This would be a bare minimum. *AW&ST* estimates that its more elaborate conceptual satellite would weigh 100 tons. The cost of simply bringing the weight into space would be about $600 million for each *AW&ST* satellite, $60 million for our minimum weight satellite. These figures do not include the cost of manufacturing the delicate devices which would go on the satellites.

Another way to estimate costs would be to start with the actual costs of present satellites, which vary from $100 to $200 million, including their launch into space. The laser satellite would be bigger and more complicated. Written testimony by a strong supporter of the SDI states, "Every laser-equipped satellite will cost about as much as a Trident submarine—several billion dollars."[5]

Still another approach has been taken by George Field of the Harvard Astrophysics Center. He based his estimates of the cost of laser satellites on the known cost of optical mirrors in space. Allowing that mass production would reduce the cost by two-thirds, and neglecting the cost of the lasers, he found that it would cost between $400 million and $2 billion to destroy a single Soviet missile. This would make the cost of the laser satellite system alone on the order of a trillion dollars.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Excimer (Ultraviolet) Lasers

If we wish to produce a spot of one meter diameter on an ICBM booster at a range of 40 megameters, we would need an angular spread better than $\alpha = 1/40$ μr. If this were to be done with infrared lasers, the mirror would need to have a diameter of 140 meters, which is clearly out of the question. Therefore, it has been proposed that lasers in GEO should use ultraviolet light produced by an excimer laser. Such lasers have been demonstrated in the laboratory at much lower outputs. Their wavelength is roughly 0.3 micrometers, so that the required mirror diameter would be only 15 meters. The UV lasers would perform similarly to the infrared chemical ones, by melting a hole in the booster skin. The ten-fold more stringent pointing and tracking of UV lasers in GEO would, however, be even more difficult than for infrared lasers in LEO.

The lasing gas in excimer lasers would be a compound of a noble gas and a halogen, e.g., KrF. These molecules are essentially unstable in their ground state, but in an excited electronic state they are chemically stable. Methods have been developed to form them in excited states from the elementary gases. They will then emit ultraviolet light when the molecules return from the excited to the ground state. The ground state of the molecule will, in turn, immediately dissociate into two atoms, thereby allowing a population inversion, i.e., an occupied excited state but an empty ground state. These excimer lasers could have 6 percent efficiency, i.e., the energy in the laser beam could be 6 percent of the electric energy supplied to the gas mixture.

A problem with excimer lasers would be their weight. If it is possible to concentrate the laser beam on one square meter of the ICBM booster, we would again need 250 MJ of laser light to destroy one booster. Because the excimer would be powered by an electron beam rather than by a chemical reaction, the weight of fuel required to produce the necessary electricity is likely to be at least 3 tons, compared with half a ton for an IR laser. Worse than this, the lasing gas KrF would get hot during the laser action and would have to be replaced. Its weight may be estimated as $\simeq 25$ tons per booster destroyed. Thus, we would be confronted with the need for fifty times the weight of an IR laser. This would far more than offset the extra weight necessitated by the 6.6 absentee ratio for lasers in LEO,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

especially since it takes about four times as much energy to lift a given weight into GEO as compared to LEO. All this indicates that it would cost much more to deploy excimers in GEO than to deploy IR lasers in LEO.

An alternative to space deployment would be placing the excimer lasers on the ground and then beaming their rays through the atmosphere at a large mirror in GEO, which would redirect the beam to destroy one booster after another. This would considerably ease the weight problem, because now only the mirror and some pointing equipment would have to be carried up. Many problems would remain, however, chief among them the vulnerability of the mirror-carrying satellites. Still other difficulties that would have to be addressed include the following:

- The ICBM booster would be detected by the emission of IR from its plume, not by UV. But if an IR detector were put on the mirror in GEO, it would not have the resolution necessary to form an image of the booster adequate for pointing the UV laser with the required accuracy. If the booster plume were a tiny point like a star, fixed in position with respect to the booster itself, "beam splitting" could be used with a smaller mirror—but such is not the case. It has therefore been proposed that an auxiliary satellite be placed in LEO to observe the IR plume, do the pointing and tracking, and then transmit electronically the exact position and velocity of the booster to the mirror station in GEO. This would be an extremely complicated system, with many possibilities of malfunction.[6]

- A large amount of electric power would be needed for the excimer laser, even on the ground. Assuming 6 percent efficiency from power plant to laser, we would require about 4000 megajoules of electric power for destruction of each booster. If 1000 boosters had to be dealt with in a hundred seconds, 40,000 megawatts of electric power would have to be available. Because any given location of the ground-based lasers, even in the desert, might be covered by clouds, we should probably double this requirement. This would mean we would need the output of 80 full-size electric power stations. Since these stations would not have to give steady power, they could be of a very simple type, perhaps with oil-fired gas turbines and without cooling towers, and could probably be built for about $300 per kilowatt (instead of the $1,000 to $2,000

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

required for a modern coal- or nuclear-power station). Even so, the cost of the electric power stations alone would be $25 billion. We have not taken into account a factor-2 or -3 absorption in the atmosphere of the ultraviolet light, which would double or triple our requirements.

- Cloud cover would prevent the excimer laser's UV beam from penetrating through the atmosphere. Even with a clear sky, the normal turbulence in the atmosphere would disturb the beam, broadening it from an earth-based 5-meter diameter telescope to 1000 times that area at GEO. Furthermore, the high-intensity laser would itself cause a strong disturbance of the air, one that would change with time as the beam was operating. Schemes such as adaptive optics or phase conjugation of a pilot pulse from the GEO mirror might reliably provide a clean beam near the diffraction limit for weak lasers, but it is not clear that this could be done for the power levels needed in weapons.

Aviation Week & Space Technology, reporting on the Fletcher panel's findings, concluded that by 1989 an excimer laser could be developed that would have a power of 2 MW and a beam spread of 0.05 μr. Such a power output would clearly be insufficient in relation to the need, which we have assumed to be 25 MW.

X-Ray Lasers

As described above, the X-ray laser would be powered by a nuclear explosion that would strongly illuminate nearby material with the bomb X-rays. The actual lasing action may take place in a bundle of long, thin wires. By the nature of the process, the quantum energy in the laser beam would be considerably less than that of the X-rays in the surrounding plasma. An estimate of 1 keV for the energy of the laser quanta seems reasonable.

The X-rays would damage an ICBM booster by evaporating a very thin layer at its surface. The depth of penetration would be determined by the absorption coefficient of X-rays in the booster skin material; it would be only a micrometer or so. The surface material would be given a very high outward velocity by the X-rays. One can calculate that, for an incident X-ray flux of 100 MJ/m^2, the impulse given to the evaporated material would be P ≃ 5000 taps. (One tap

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

is 1 g/cm^2 cm/sec—the momentum carried by one gram of mass per square centimeter of surface, moving at a velocity of 1 cm/s.) The material below the blow-off layer would be pushed inward with a momentum equal to P. This would have two consequences. One is that the booster as a whole would recoil with a velocity $\Delta v = PA/M$, where M is the mass of the booster and A its lengthwise area. A reasonable estimate is $M/A = 100$ g/cm^2, and the corresponding recoil is $\Delta v \simeq 50$ cm/s. Such a recoil, if uncorrected, would cause the reentry vehicles carried by the booster to impact about 1 kilometer away from the intended target. If that target was a hardened missile silo, this amount of deflection would save the silo. However, if the target was soft, and especially if it was in or near a city, the deflection would make hardly any difference. Moreover, modern inertial guidance devices should be able to correct for such a recoil incurred in powered flight.

The other effect of the X-ray impulses would be elastic, and possibly plastic, deformation of the booster skin. The velocity given to the booster skin would be $V = P/m$, where m is the mass of the skin per cm^2. We estimate m = 1 to 3 g/cm^2. The kinetic energy per gram, $1/2\ V^2$, would have to be taken up by the elastic deformation energy or by special mitigation means. Reasonable assumptions on the strength of the booster indicate that an impulse of $P = 5000$ taps would be just enough to damage a booster skin of reasonable strength and thickness. We therefore estimate that the X-ray flux to the booster would have to be at least 100 MJ/m^2 in order to do substantial damage.

Other "kill mechanisms" are conceivable. In particular, certain booster weaknesses might reduce the required X-ray flux by as much as a factor of 10. However, we must assume that the Soviets, faced with the existence of an X-ray laser, would be very careful to design the booster skin in such a way that it would not have such weaknesses.

A further advantage of the nuclear-powered X-ray laser is that it would give its pulse in a very short time, perhaps 10–100 ns (nanoseconds). During such a short time, the booster would not move appreciably, in contrast to the optical lasers which would have to dwell on the booster for several seconds. But the nuclear explosion scheme has the obvious disadvantage that it would be just a single shot.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

An X-ray laser beam could not be focused by a mirror because there are no materials that back-reflect intense soft X-rays. Instead, the beam would be defined by the geometry of the wires in which the lasing action takes place, and would be rather broad.[7] This would put high demands on the total laser energy, which would have to fill with lethal energy a spot much *larger* than the booster target; although it would relax the requirement for pointing accuracy.[8] An attractive feature of the X-ray laser is that the weight of the device could be moderate since the energy source would be a nuclear explosion. This makes it possible to consider deploying the X-ray laser in a pop-up mode, a technique that would not be available for the much heavier and larger IR or UV lasers. In pop-up, the device would be launched only when an enemy ICBM attack was detected. In this way, the vulnerability of weapons deployed in space would be avoided, but not the vulnerability of sensors in space. Pop-up also would avoid violation of the 1967 treaty prohibiting the stationing of nuclear weapons in space, but that treaty is in any case unlikely to survive a space test of the X-ray laser, which would also violate the 1963 Limited Test Ban.

The principal difficulty that the pop-up scheme has to overcome is that the laser must have the ICBM in its line of sight while the ICBM is still in its boost phase. To achieve this, the X-ray laser must be raised to a very high altitude that will increase as the distance from the point of the pop-up launch to that of the ICBM launch site increases. No point on the territory of the U.S. is closer than about 6000 kilometers from most of the Soviet ICBM launch sites, and 9000 kilometers is more typical. Thus, it has been proposed to launch X-ray lasers from submarines located either in the Indian Ocean south of Pakistan, at a latitude 22–24°, or in some Arctic seas. The latter alternative would put the laser launch within a great-circle distance of about 4000 kilometers from some of the ICBM silos.

These relationships are demonstrated in figure 2 and in the following calculations:

The earliest possibility for the Soviet ICBM to come into view is "beyond the horizon," as is shown in figure 2. The X-ray grazes the atmosphere at a certain height H_O, the target is at a height $H_T > H_O$, the laser rocket at a height H_H. The horizon is determined by the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

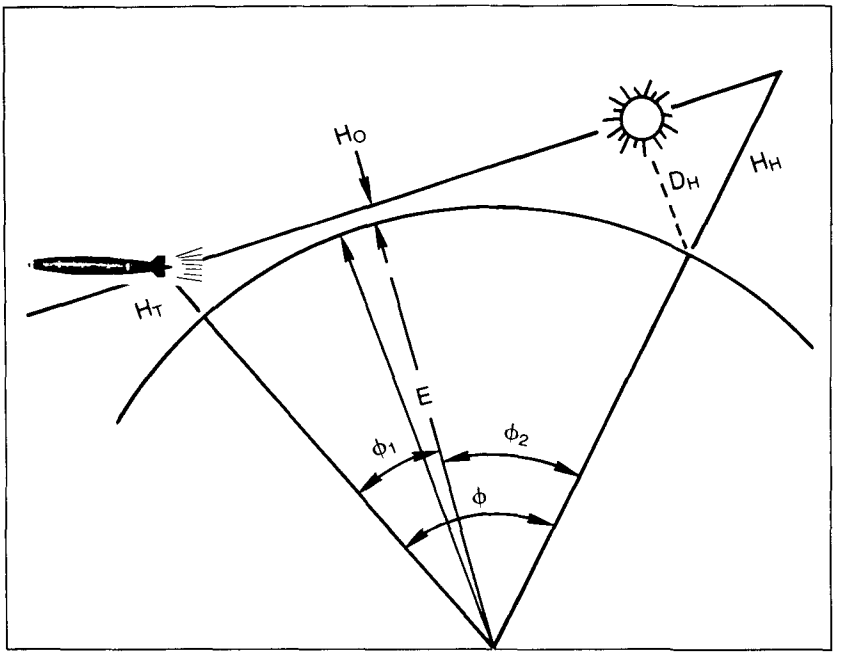


Fig. 2 Geometry of Pop-up Intercept. For a target at height H_T and a line of sight that grazes the earth at altitude H_O, the interceptor ("hunter") must be at altitude exceeding H_H, as shown. Also indicated is the "interceptor flight" distance D_H to the line of sight.

condition that the X-rays passing through the atmosphere at H_o should not be too much attenuated. To determine H_o, we must calculate the amount of matter traversed along the horizontal line in figure 2. The density of air decreases approximately exponentially with altitude $\rho = \rho_o e^{-H/L}$, where L is the scale height. At the relevant altitudes, L is $\simeq$ 18 km. By integration, the amount of matter along the horizontal line is then $\sigma = (2\pi LR_o)^{1/2}\ \rho(H_o)$, where H_o is the minimum ray altitude and E or R_o the radius of the earth. An X-ray beam of 1 keV will penetrate $\sigma = 3.0\times10^{-4}$ g/cm^2 of air, at which point its intensity has decreased to 1/e = 37 percent. Inserting σ, L, and R_o, we find $\rho(H_o) = 3.5\times10^{-12}$ g/cm^3, corresponding to H_o = 155 km.

Let now H_T and H_H be the altitudes of target and "hunter." Then the geometry of figure 2 shows that

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Table 1 Pop-Up Intercept Altitude and Time from 4000-km Standoff

	SS-18	MX	Medium-fast burn	Fast-burn
Burn-out altitude (km)	400	200	160	90
Burn-out time (sec)	300	180	130	50
Interceptor flight (km)	571	995	1355	—
Time to intercept (sec) given $M_o/M = 30$	85	127	162	can't intercept
Time to intercept (sec) given $M_o/M = 15$	93	146	190	can't intercept
Intercept possible?	yes	marginal	no	no

$$H_T - H_o = R_o(1/\cos\phi_1 - 1) \simeq 1/2\ R_o\phi_1^2$$

$$H_H - H_o = R_o(1/\cos\phi_2 - 1) \simeq 1/2\ R_o\phi_2^2$$

The last members of these equations are calculated with the assumption that the angles ϕ_1 and ϕ_2 are small. This will only be true if the angular distance of hunter and target is small. With our choice of launch points, ϕ is about 35°. We have, of course, $\phi_2 = \phi - \phi_1$. Evaluating, we find

$$H_H = [\phi(R_o/2)^{1/2} - (H_T - H_o)^{1/2}]^2 + H_o$$

With our choice of ϕ we have $\phi(R_o/2)^{1/2} = 35\ (\text{km})^{1/2}$

The altitude to which the X-ray laser must rise in order to have a line of sight to the booster therefore depends sensitively on the booster's burn-out altitude. If the booster burns slowly, its burn-out altitude H_T would be great (to achieve ICBM speed of 7 km/s) and the hunter would not need to go very high. In addition, the hunter would have much more time to gain the required altitude and would not have to reach such a high speed; thus a much smaller fraction of its initial mass would need to be rocket fuel. On the other hand, a fast-burn booster would make necessary a very large interceptor to deliver a small X-ray laser payload very rapidly to a high altitude. Table 1, above, gives the necessary interceptor flight distance for several booster burnout altitudes, as well as the time required to fly to those points (calculated exactly, not with the assumption that ϕ_1 and ϕ_2 are small). The table is calculated for a great-circle distance of 4000 kilometers, a minimum X-ray beam grazing altitude of 160 kilometers, and intercept just at booster burnout. Both interceptor times are calculated for an interceptor that has the same acceleration

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

as a fast-burn booster—i.e., one acquiring 7 km/s of speed in 40 seconds (constant 17.5 g acceleration)—and with two alternative values of the overall mass, either 30 tons or 15 tons per ton of payload. For a rocket propellant with a specific impulse of 300 seconds and perfect staging, this corresponds to interceptor burnout speeds of 10.2 km/s or 8.1 km/s respectively, and the times as shown in the table. A one-ton X-ray laser payload would thus require a 30-ton or 15-ton submarine-based interceptor missile. (The Poseidon SLBM weighs about 30 tons.)

In this table "interceptor flight" is the shortest distance from an interceptor launch point to a line drawn from booster burnout to graze-altitude, calculated exactly. Times and mass ratios ignore gravity. Interceptor speed is obtained from rocket exhaust velocity $gI_{sp} = V_e$; and $M_o/M = \exp(V/V_e)$. Interceptor burn time is then $T_o = V/g'$ (with $g' = 0.175$ km/s^2), and interceptor flight time to distance D is $T = T_o/2 + D/V$.

We have to add to the numbers in table 1 the time needed before the interceptor rocket can start. This includes the time for detection of the ICBM launch by early-warning satellites, for communication of this warning to the rocket-launching submarine, for the actual launching of the rocket until it breaks out of the water, and finally for aiming of the X-ray laser. At present, the first of these alone takes about two minutes. Allowing for improvements, surely 30 seconds is a low estimate for all these activities. Thus, if the booster burned out at 200 kilometers, the interceptor rocket would have to reach its station and be ready to fire its X-rays about 150 seconds after it was launched.

Most of the boosters presently in the arsenals of both sides have a boost phase that lasts longer than 150 seconds. The boost phase of the MX (presently being developed by the U.S.) is about 180 seconds, allowing barely enough time for attack by a pop-up X-ray laser. The Soviets could certainly equal this performance if the existence of a U.S. X-ray laser gave them the motivation to do so. Of course, a greater interceptor speed would cut the interceptor boost time; but to attain even 12 km/s interceptor speed would require an interceptor with a gross weight of 55 tons for a one-ton payload. Considering the relative ease of shortening the boost phase of ICBMs compared with the difficulty of reducing the intercept time of submarine-launched

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

interceptors armed with X-ray lasers, we believe that the pop-up scheme of attacking Soviet ICBMs can never be viable.

As we mentioned earlier, the laser would be launched about 4000 kilometers from the Soviet ICBM sites. Assuming then a beam width of 50 μr and requiring a flux of 100 MJ/m^2 on the booster, the X-ray laser would have to emit a total energy of 1 kiloton (kt). But this laser energy would be only a fraction of the total energy of the nuclear explosion. The exact fraction is not known, but it is unlikely to be as high as 1 percent. Therefore, a successful X-ray laser would have to start with an explosion of at least 100 kilotons.

But 100 kilotons is unlikely to be sufficient. The reason has to do with the fact that X-ray laser beams cannot penetrate far into the atmosphere. At 1 keV, the beam penetrates $\simeq 3.0 \times 10^{-4}$ g/cm^2 of air, at which point its intensity has decreased to 37 percent. At vertical incidence, this penetration would bring the beam to $\simeq$ 105 km altitude. If beams of very high intensity could be attained, let us say 100 MJ/m^2 on average, they would remove some of the electrons from the N and O atoms and thus "burn through" some of the air; this might increase the penetration to $\simeq 7 \times 10^{-4}$ g/cm^2. To accomplish this, initial laser energy would have to be raised from 1 to about 3 kilotons (the explosive energy from 100 to at least 300 kilotons, a very high yield) if targets are to be attacked even at vertical incidence to an atmospheric depth of 7×10^{-4}g/cm^2.

While popped-up X-ray lasers thus seem unlikely to be effective against ICBMs, there remains a possibility that they could be effective against SLBMs launched at close range against targets near the U.S. coast. In this case, the rockets could be popped up from the American continent, and the angular distance ϕ between the rocket and the SLBM would be small. The X-ray laser could therefore be in place before the SLBM burns out. An operational countermeasure by the offense would be to launch the SLBM on a strongly depressed trajectory so that the booster would burn out at such a low altitude that the X-rays could not penetrate, i.e., below $\simeq$ 110 km, with no fast-burn booster needed.

Particle Beams

It has been suggested that a beam of very fast particles could be used to attack an ICBM or SLBM. For instance, protons of 500 MeV (three-fourths the velocity of light) would penetrate all the way into

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

an ICBM or reentry vehicle, severely damaging its delicate electronics, and thus disturbing the guidance system of the missile or the firing circuit of the nuclear weapon.

Protons (hydrogen nuclei), however, cannot be used directly in a particle beam because they would be strongly deflected by the magnetic field of the earth, and therefore be difficult to aim. To make matters worse, the magnetic field fluctuates. This problem can be avoided by the use of a beam of neutral hydrogen atoms, available at lower intensities in various laboratories. To accelerate such atoms to high velocity, one starts with negative hydrogen ions, H^-, i.e., hydrogen that has two electrons rather than one orbiting the nucleus. It is not easy to produce large currents of H^-, but it has been done in some particle accelerators, notably TRIUMF in Vancouver and LAMPF at Los Alamos. In these facilities, H^- beams are produced and accelerated to energies of 500 and 800 MeV, respectively. Such energies would be useful for beam weapons. After being accelerated and aimed precisely at its target, the H^- would be passed through a very thin foil or a gas cell. The extra electron would be stripped off, the gas pressure having been carefully chosen so that, insofar as possible, only one electron is stripped. The result would be a beam of neutral hydrogen.

An important property of any beam is its angular spread. Even with a perfectly parallel beam from the accelerator, the neutral H beam will have a certain minimum spread because the extra electron removed from the H^- has a certain momentum relative to the nucleus of the atom. The distribution of this momentum can be calculated from quantum mechanics, but neither the actual magnitude nor its direction can be predicted or controlled for a particular atom.

When the extra electron is removed by collision with an atom, the remaining neutral H will have a momentum equal and opposite to that of the electron. In principle, neutralization might be accomplished by laser removal of the second electron, and if the laser wavelength is barely short enough to eject the electron, the divergence so introduced into the beam could be less than that from neutralization by collision. But it does not seem practical to laser-strip a beam of large area and near-continuous current. Stripping by collision would give a minimum angular spread of the neutral H beam of $\simeq 1$ μr (microradian), no matter how well the H^- beam was collimated. This means that at 3000 kilometers from the accelerator, the beam

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

would be spread over 3 meters. The designer must try to obtain an H^- beam which has a divergence of < 1 microradian. At the same time, the intensity of the beam must be maximized.[9]

To penetrate deeply enough into the booster and then into the RVs, in order to affect their semiconductor components, the energy of the particles in the beam must be about 300 MeV or greater. To destroy silicon semiconductor circuitry, one may need $\simeq$ 10,000 rad.[10] Taking into account that the energy deposited by a proton of 100 to 300 MeV is about 3 MeV per g/cm^2, the required incident energy would be about 0.2 megajoule/m^2, much less than for those lasers previously discussed. To fill a beam spot of 3-meter diameter from 3000 kilometers, we would thus need 1 MJ of particle beam. At an energy of 300 MeV, this would mean 3 mA-sec (milliampere-seconds). An H^- beam of 1 mA would need to dwell on the target for 3 seconds. We could consider having an accelerator work for 100 seconds, so that one accelerator could destroy 30 boosters. At a beam current of 100 mA, one accelerator could destroy the electronics of 3000 boosters in 100 seconds, providing it could itself survive and target accurately and instantly one booster after another.

The weight of the accelerator is likely to be rather large, while that of the power source required for the particle beam probably smaller. An attractive feature of the particle beam is that it may be steered to a certain extent by electromagnetic means before it is neutralized; this would make it possible to attack several targets in succession without swinging the entire accelerator. Because the magnetic steering operates on a beam of large diameter at the output of the beam expansion telescope (perhaps 40 centimeters in diameter), if large steering angles are required the magnetic steering system can become very massive—perhaps weighing hundreds of tons.

Particle beams have a serious limitation: the neutral atoms will not remain neutral once they enter the atmosphere; collisions with the air atoms will strip off the electron. We estimate that this will happen at an air density of $\simeq 10^{-11}$ g/cm^3, which corresponds to an altitude of about 140 kilometers. Once the electron has been stripped from the H-atom, the remaining proton is subject to deflection by the earth's magnetic field (as discussed above). Since the stripping occurs at different altitudes, the beam will change into a fan whose width will be $\simeq$ 300 m at $\simeq$ 130 km altitude. This means that the density of particles in the beam would be decreased by a factor of 100, so that

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

a hundred-fold increase in the beam intensity would be necessary to compensate. This is beyond the foreseeable beam intensity. We have previously mentioned that it may be possible to develop boosters that would acquire their full velocity at ≃ 90 km altitude. A particle beam would be worthless against such a booster.

Another possibility is that particle beams might be used against the "bus" that remains after the various acceleration stages of the booster have been discarded. The bus will go to a higher altitude than the booster. It will not have as conspicuous a flame as the booster and will therefore be more difficult to detect and target. It would have to be hit, moreover, before it dispenses its RVs and decoys. The bus's electronics are essential only for providing guidance in the boost and post-boost phase. If the particle beam were to be used in mid-course, it would probably have to destroy structural components or the high explosive, which would require much greater beam power. Single-warhead missiles and even MIRVed missiles can be built without a bus. In mid-course, there would normally be no air to obstruct the particle beam from reaching its target, but a shield of air might be raised by large nuclear explosions near the top of the atmosphere specifically as a countermeasure to particle-beam intercept.

It has been suggested that a particle beam could be produced by a nuclear explosion, rather than by a particle accelerator. No method is known however, for forming a highly collimated beam of protons, let alone neutral hydrogen atoms, from a nuclear explosion. In part, this is because all the energy must be used in the small fraction of a microsecond before the system is destroyed. This would also be a one-shot affair, and could only with difficulty be directed against more than one booster or bus.

This view of the effectiveness of a neutral particle beam weapon is based on a 10,000 rad semiconductor kill dose. But MESFET circuits made of gallium arsenide (GaAs) may withstand gamma radiation doses far beyond this—perhaps 10 megarads (100 joules/g)[11]—which is in the dose range required to overheat or melt structural materials, destroy explosives, and the like. Such a dose corresponds to ≃ 160 MJ/m^2 and could be achieved in 10 seconds only with a 100 megawatt accelerator. Defect generation by the protons from the beam (or by secondary neutrons) would set a comparable dose limit.

The SDI Program Office has mentioned approvingly a suggestion to use anti-matter beams (just 5 micrograms of anti-matter could

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

produce 1000 MJ of annihilation energy). To produce 5 milligrams of anti-matter to feed the accelerators so that they could deliver 1000 MJ against each of 1000 boosters, 5000 particle accelerators as powerful as the most powerful existing one, that at Batavia, Illinois, would have to work for a full year. Even then, the problem would remain of preserving the anti-matter and accelerating it (as anti-hydrogen atoms) against the Soviet boosters. Calculation shows that anti-matter would in any case have little advantage over normal hydrogen.

HOMING KILL (KINETIC ENERGY) VEHICLES

Use for Boost-Phase Intercept

Kinetic energy kill of ICBMs in boost phase is entirely feasible, especially considering the fragility of the booster and its very substantial area. The difficulty is not in killing the booster, but in *reaching* and striking it while it is still boosting.

In ground warfare, the requisite velocities are obtained either by a gun—in which the velocity is given impulsively to the projectile while it is within the tube of the launcher—or by a rocket, for which gas expelled at high velocity from a nozzle at the back of the projectile continually increases the momentum of the projectile while reducing its mass. Many decades of effort have gone into the development of anti-tank guns that produce velocities of 2 km/s; such a velocity from a gun in space would carry the projectile only 400 kilometers during a nominal booster burn time of 200 seconds—not a useful distance. The limitation is that the gases from an explosion in the stationary gun barrel move only at rocket-propellant velocities, and can no longer push on the projectile when it is going faster. Thus, approaches to higher velocity guns include the use of hot-hydrogen propellant, with higher sound speed and hence larger maximum velocity of expansion.

Current interest in the use of guns for ICBM boost-phase intercept centers on space-based electromagnetic "railguns," in which the projectile would complete the circuit between two conducting bars or rails. A modest voltage applied to these rails would produce very large currents, the magnetic field behind the projectile expelling and continuously accelerating the projectile. Sub-kilogram projectiles

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

have been accelerated in this fashion to speeds of 10 km/s, and somewhat more is feasible. Nevertheless, railgun-launched projectiles would be useful for boost-phase intercept only if they are *guided,* in order to cope with booster maneuver and uncertainties in predicted booster position.

Another approach to intercepting the ICBM before the end of its boost phase would be to use space trucks (so named by the High Frontier project). Each of these would carry enough rocket-propelled kill vehicles to destroy all ICBMs that might be launched within its range. There would be a clear trade-off between the spacing of such space trucks (and the number of kill vehicles required) and the velocity given to each kill vehicle (beyond the 8 km/s orbital velocity of the space truck). In its 1982 publication, High Frontier considered 1 km/s velocity, which in a nominal 100-second boost phase could move a kill vehicle only 100 kilometers. We will shortly consider a projectile velocity of 8 km/s, which could be imparted to a 5-kg homing warhead that had an initial total rocket mass of some 50–100 kg.

Railguns would of course impart velocity in a *very* small fraction of the distance to the ICBM, and we assume here that rocket-propelled projectiles would achieve their burnout velocity in only a few seconds. Either type of projectile would coast the rest of the way. Both would miss the booster if they did not keep it under constant observation and adjust their trajectories as necessary. As they near their quarry, these homing kill vehicles (HKVs) would observe the flame of the rocket booster and readjust their course accordingly. In the case of the HKV associated with the U.S. F-15-launched ASAT, these adjustments are made by firing one or more of fifty-six small rockets clustered around the spinning HKV and directed by an infrared telescope. A similar technique was used by the HKV tested June 10, 1984 on a Minuteman-I booster. For boost-phase intercept, the infrared sensors need not be cooled, since the rocket flame would emit short-wave IR, rather than the thermal IR that is used for homing on satellites or ICBM RVs. Nevertheless, the rocket flame is *not* the vulnerable part of the booster, and the HKV has to exercise a great deal more intelligence than is required simply to direct itself toward the booster flame. This autonomous intelligence necessary in HKVs is also a source of their vulnerability.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

One can hardly object to modest investigations of railgun propulsion, but old-fashioned rockets seem to have the advantage in firing rate and in the efficiency with which they convert thermal to kinetic energy. For a perfectly staged rocket, final velocities of 4, 5, 6, and 7 times the exhaust velocity (3 km/s for normal rocket propellents) would provide payload kinetic energies of 29, 17, 9, and 4.5 percent of the initial fuel energy. The corresponding rocket masses would be 55, 148, 403, and 1000 times the homing payload of the rocket. To match the 9% energy transfer from propellant to HKV, a railgun obtaining its electrical energy from propellant at 30% efficiency would have to convert this energy to kinetic energy of the HKV with a further 30% efficiency. One must add to these advantages the very high peak-firing capability of a rocket cluster (because of the independent acceleration of each of the rockets) and the absence of investment in large masses and power supplies. It would therefore seem that railguns with a velocity below 20 kms/sec are not competitive for launching HKVs against boosters. Nor are there any indications that railguns would work well at higher speeds.

Boost-phase intercept by HKV has assets and liabilities. With a perfect telescope 10 centimeters in diameter operating at a near-IR wavelength of 3 micron (suitable for boost-phase intercept), the diffraction limit of an HKV would be 30 microradian. At 100 kilometers, this would correspond to a 3-meter diameter resolution spot. The best the HKV could do from such a distance would be to determine the center of the booster flame and guide itself to a preset "lead" in order to have the minimum final correction.

The imperfections of the HKV system could easily be exploited by the use of various offensive countermeasures. For example, boosters at high altitude could improve their survival by modest irregular accelerations. While this would reduce the rocket's maximum range slightly, it would impose unattainable maneuvering requirements on the HKV. Large foil screens carried by the booster could obscure the flame, thereby preventing homing altogether. Also, the explosion of nuclear weapons at high altitudes could provide background heat that would make more difficult the tracking of the boosters by near-IR detectors. Finally, if directed against fast-burn boosters, near-IR homing would be impeded at altitudes up to 100 kilometers by the glow of air heated by the passage of the HKV itself. Special

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

filters could, however, help the HKV continue to see the booster in the presence of this hot-air background.

The principal problem an HKV would have in intercepting fast-burn boosters would be *reaching* the booster in the 40-seconds available and at altitudes of 80-kilometers or lower, where burnout would occur. For instance, in 40 seconds an 8 km/s added-speed HKV could move no further from its moving space truck in orbit at 300 kilometers (in order to have a reasonable lifetime against orbital drag) than to a 230-kilometer radius circle (at 80-kilometer altitude). Such a space truck might have to handle up to 200 ICBMs; about 400 HKVs would have to be provided by that single space truck or others at the same point. Since something like 1000 space trucks would have to be in optimum orbit in order to have an average of *one* within range of a given ICBM (for 230-kilometer range), some 400,000 HKVs would have to be in orbit in order to counter 200 fast-burn boosters launched from each of 10 launch fields (if there were no other problems). At 100 kilograms per HKV, this would amount to 40,000 tons in low near-polar orbit at a launch-cost alone of $240 billion.

Use for Mid-Course Intercept

Once an RV is identified in mid-course and an HKV assigned, as much as 10 minutes would be available for the intercept. In this time, HKVs moving at 4 km/s could be marshaled from distances as great as 2400 kilometers. For defense of the U.S., the intercepts would take place north of 70 degrees latitude over Canada. A satellite in polar orbit has $2\times(90\text{-}70)/360 = 0.11$ probability of being above 70° north, and $2\times2400/40{,}000 = 0.12$ of being within an additional 2400 km of 70° north. That part of Canada below 70° north occupies about 22 degrees of latitude and 60 degrees of longitude. The added probability of a polar orbit satellite being within 2400 km (22° of arc) of Canada $\simeq (60+(2\times22)/\cos\lambda)/360 \times (22/360) = 0.027$, for a total fraction of satellites $(0.11+0.12+0.03) = 0.26$ of space trucks able to contribute their HKVs—an overestimate.

Based on the above calculation, we arrive at an absentee ratio of 4, i.e., for every space truck within 2400 kilometers of the battle area and thus able to contribute an HKV, three others could do nothing regardless of whether they were above the horizon and able to see. Hence, against 10,000 RVs (with no decoys), about 40,000 HKVs in

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

orbit would be required, or perhaps 80,000 to provide greater reliability. If the targets were more concentrated, even fewer space trucks could participate.

These calculations assume that there would be perfect discrimination, so that no HKVs would be launched against decoys. Once discriminated, RVs would still not necessarily be vulnerable to HKVs. An RV need emit a decoy tethered at a distance of 10 meters or more only once in a while to totally confuse an HKV. If the HKV had enough intelligence to recognize that there were two or more objects in its field of view as it approached the RV, it would probably still be unable to choose the correct one. (The "centroid problem," familiar from air defense, arises in space as well.) One can imagine a command link to each HKV so that the SATKA (surveillance, acquisition, tracking, kill assessment) system could help it discriminate as it approached an RV, but there is no reason to believe that SATKA itself would be able to discriminate (or that it would survive to do so).

For mid-course intercept, HKVs would need cooled IR detectors and would have to pursue, not 1000 to 2000 boosters, but 10,000 RVs and 100,000 to one million decoys. Alternatively, a cooperative SATKA could occasionally illuminate each of the mid-course targets in turn with weak laser light to provide a short-wave (say one micron) signal for the HKV homer; this target-designating "semi-active homing" scheme is less demanding than a radar or laser homer in each HKV. With the absentee ratio of 4, however, we could need some 400,000 to 4 million HKVs in orbit to attack the decoys alone.

Use as Anti-Satellite Weapons

Kinetic energy projectiles can be extremely effective as anti-satellite weapons. Because satellite orbital velocity ranges from 3.6 km/s in GEO to 8 km/s in LEO, and because satellites are for the most part light and very vulnerable, even a 1-gram projectile in the path of a satellite could cause its destruction. As is discussed in the chapter by Kurt Gottfried and Richard Ned Lebow, the direct-ascent ASAT interceptor would work in exactly this way, interposing in the path of a satellite a non-explosive few-kg "warhead," a similar warhead equipped with a steel mesh or net to increase its effective area, or a pellet cloud.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Against satellites in GEO, direct ascent would provide an impact velocity of 3.6 km/s or more—greater than that of the fastest anti-tank weapon available. Without defensive satellite measures, a counter-rotating satellite in GEO would provide some 7.2 km/s relative impact velocity, which would allow use of a warhead smaller by about a factor of 4 or more. Against shields, pellets could be made more lethal by proper shaping. Shaped as a sphere, a projectile might penetrate a shield 10 times as thick as its own diameter. A projectile in the form of a dart aligned with its impact velocity could penetrate 10 times the length of the dart. One could arrange to orient a payload of darts appropriately, even those mounted on an umbrella or net. We may conclude that kinetic energy weapons of the types described might play a crucial role in countering satellite-based BMD.

Use for Terminal Defense

At the end of its flight, the RV will reenter the atmosphere and move towards its target. For reasons that will become evident, HKVs would be the defensive weapons of choice at this stage.

The HKV used in a high-endoatmospheric defense would have the apparent advantage of being non-nuclear; it thus would not interfere with the defense against other RVs. It also might have a low enough cost to make intercept of non-discriminable decoys cost-effective. Neither of these advantages is likely to be sufficient, however. The offense can always "salvage fuse" to provide a megaton detonation (instead of the few kilotons typical of nuclear-armed interceptors). In addition, it would seem difficult for an HKV to match the low delivery cost of a high-altitude decoy.

The general basing requirements for terminal BMD would be much the same as those used for other phases of missile defense. Basing must insure the survivability of the defensive system itself and must make it possible for the system to acquire and destroy the ballistic missile threat effectively.

The demands on city defense would obviously be much greater than those on hard target defense. It would be very difficult to defend a city because, relative to silos, for example, buildings in the city are very soft, and people are vulnerable to fires as well as to collapsing buildings. Therefore, any enemy missile, even if exploded quite high above a city, would cause enormous damage. Modern missile tech-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

nology has aggravated this problem by the introduction of maneuvering RVs: they may appear during mid-course to be aimed at a point perhaps 100 kilometers away from a city, but after entering the atmosphere, they may pursue a horizontal flight for some distance and then descend towards the city.[12] There could be many variations on this procedure. Furthermore, the use of non-nuclear armed interceptors within the atmosphere would not preclude the explosion of the RV warhead at the moment of intercept. Aside from complicating greatly the task of other sensors and interceptors in their attack on other RVs, such an explosion could devastate the urban target with an intense thermal pulse. But low-yield nuclear-armed interceptors (which do no damage to the defended cities) are themselves no guarantee against powerful enemy detonations at altitudes somewhat above those at which intercept can be accomplished—so-called "ladder-down" tactics.

Another important difference between city defense and missile silo defense is that, in the case of the silos, the strategic planner would be satisfied if only a certain fraction, say 20 percent, survived, whereas it would be totally unacceptable if only 20 percent of the population of a city were to survive. In addition, there are far more silos than cities, with each silo a more difficult and less valuable target.

Use of HKVs in Terminal Defense of Silos

Interception in the terminal phase is easier than in mid-course, provided one is satisfied to defend small, numerous, preferably hardened targets such as missile silos.

The classic "hard point" ABM system has a radar on the ground that locates and tracks incoming reentry vehicles, and then launches an interceptor against them. If one allows the incoming RV to descend to an altitude of about 10 kilometers before launching the interceptors, the incoming swarm of decoys will automatically have been sorted out. Plastic balloons will have burned up long before, and heavier decoys will have been greatly decelerated. RVs, on the other hand, will still have a velocity not far below their original velocity in space. This ability to discriminate RVs from decoys at low altitude makes it possible to defend against an ICBM attack on silos with a limited number of defensive missiles, perhaps two interceptors per RV to be destroyed. If the task is to preserve a small fraction of the silos for a short time, "preferential defense" will provide the defense with

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

an additional cost leverage so long as it can conceal which silos are being defended.

Ground radars that detect and track incoming missiles will be less hardened than the ICBM silos they defend. Proposals have been made to use many very small radars for each field of missile silos, and to consider them expendable. These small radars would be sufficient if we wished to detect incoming RVs at only a short distance, say 10 kilometers.

If a radar and BMD system need only enforce a keepout range of 500 meters from the single silo it defends, and if it need do that against only a few missiles, totally different BMD approaches become feasible. One of these involves the use of silo-based mini-radars. They have come to be known as "Kleenex radars," because after one is used in combat it is discarded and another takes its place. (Others have used this name because there is only "one blow per radar.") Such single-silo defense radars could be cheap if they were located a few kilometers north of the silo, looking up, and could see the incoming RVs side-on, rather than having to see them nose-on at a distance of hundreds of kilometers. A corresponding weapon for killing the RV could be a clustered launcher for small (few-kg) unguided rockets, of which perhaps 10,000 would be launched against the point at which an RV is predicted to appear at a range of 500 meters or 1 kilometer from the silo target. Such a system has been dubbed Swarmjet, and there is little doubt that it could increase the price of a silo to the attacker from 2 RVs to 3 or 4—more if the attack were not concentrated in time. The individual Swarmjet rockets would be blown off course if fired into the high winds of the preceding nuclear explosion, but in an attack extending over hours, many RVs could be defeated by successive waves of Swarmjet interceptors. If the warheads (large pellets) are carried in a single stabilized fast-burn interceptor rocket to the intercept point at 500 or 1000 meters from the silo, immunity to high winds could be achieved and the non-nuclear silo defense extended to RVs arriving in a brief attack.

Still another approach would use the same silo-based mini-radars to identify individual approaching RVs and to detonate a nuclear explosive buried in the ground 1 kilometer north of the target silo. The column of earth so produced would bar access by RVs for a short time. A number of such explosions would produce a local pall in the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

upper troposphere that could bar access by accurate high-velocity RVs for 30 minutes or more. A combination of Swarmjet rockets, mentioned above, with these buried nuclear explosives could provide an effective, though temporary, defense of each missile silo being defended. Since defense of silos is presumably feasible and a far-from-perfect defense suffices, not much is gained by adding to it other layers of defense, e.g., against the boost phase or in mid-course. If money is to be spent on defending silos, it is better spent entirely on defensive installations in their immediate vicinity.

Such defenses would not be effective against attacks on cities. They also could not effectively defend a small number of valuable targets, such as command posts, against a large force, even if the targets were very hard. Over a considerable period, very many reentry vehicles could be launched against each of these valuable targets and would eventually overwhelm them.

SATKA SYSTEMS

For almost two decades, the U.S. has operated short-wave infrared telescopes on satellites in synchronous orbit with the mission of detecting the launch of ICBMs and SLBMs, whether for a peacetime test or a wartime attack. These early-warning satellites report via radio to U.S. command headquarters and would play an important role both in the decision to launch U.S. retaliatory strategic forces and in the choice of targets.

Similar satellites would play a key role in a system of boost-phase intercept or in a layered defense against ballistic missiles. For BPI, one would need a survivable, near-IR satellite system able to deal with up to 2000 simultaneous launches without missing more than a very small fraction. This system would also be required to discriminate real launches from laser excitation of the satellite sensors designed to simulate launch, and from fake dummy boosters that might be launched to attract costly and scarce BPI weapons. The satellite system must furthermore operate in the presence of laser excitation intended to desensitize or overload the warning and tracking system. In addition, the communication links must be reliable and invulnerable, perhaps even closing the loop in space so as to avoid the vulnerability of ground-based segments and any delay in human intervention. For BPI, the job of the warning satellites would largely

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

be accomplished when one or more weapons had been assigned to their targets. With homing kill vehicles, there would be no time for re-attack, although there might be with speed-of-light directed energy weapons. In the latter case, the kill-assessment role of the system would come into play.

In BPI, each of the assigned weapons would have to have its own navigation and reference system, so that when a target is identified at given geocentric coordinates, the weapon could immediately set its long-range tracker on the booster and quickly identify and refine the required line of sight. Such identification and tracking would initially be accomplished by means of an IR telescope on the weapon itself. This telescope need have only enough diameter to receive a signal adequate for tracking and for pointing the fine sensor. However, if the directed energy of the weapon is to be concentrated on a spot of one-meter diameter, the booster itself must be *imaged* to such an accuracy. Because the offense can easily arrange for the brightness of the booster to vary in space and time, this cannot be done by "beam splitting," as is customary with high-precision anti-aircraft or anti-missile radars, but must be done by real imaging of the booster. Since the booster does not glow in the near-IR, the weapon would probably have to use a laser of moderately short wavelength and a mirror of appropriate size in order to flash-illuminate the missile often enough and with a bright enough light to provide an adequate image. Stipulating that 10 photons must enter the detecting aperture for every 10-cm resolution element on the booster, and assuming that the laser has to illuminate 200 sq m in order to have a *field* in which to locate the 1-m diameter spot, we find that at 3000-km range and for a 1-sq m receiving telescope, some 200 J of light would be required per pulse. This assumes 10 percent reflectivity of the booster. If a full 10-m diameter mirror were used in the visible or ultraviolet for this imaging task, only $\simeq$ 2 J per pulse would be required. This would be a very modest laser requirement, but a very big mirror requirement.

From synchronous orbit, and with the same mirror system as assumed for LEO, 10,000 times the imaging power would be required. Another problem is that it takes light 0.25 seconds to travel round-trip from synchronous orbit, which with 2 g random modulation of booster thrust corresponds to $\simeq$ 0.6 m jitter, even assuming otherwise perfect tracking.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Mid-course intercept must fail unless the deployment of decoys can be observed reliably, and only the real RVs held in track. Otherwise, the sensors would have to scan all of space to pick up all objects that might suddenly appear, and would continuously be expending energy and computing power tracking a million decoys. The countermeasure of using an umbrella to shield the deployment process from prying eyes seems attractive; it would be far more difficult to build the required observation capability or to defeat the umbrella that would shield against both light and radar observation. This is a classic example of an element of defense which is not "cost-effective at the margin," because the countermeasures are easier to achieve.

This section has only given a glimpse of the problems connected with integrating a BMD system. The chapter by Charles A. Zraket discusses these matters more fully.

SUMMARY EVALUATION

We find space-based BMD very unpromising as a defense against a strong offensive threat such as that posed by the Soviet Union. Even the most credible BMD, based on chemical lasers, would require staggering numbers of satellites if the Soviet Union made the modest expenditures to supplement its offensive force with 3000 fast-burn boosters.

About 1300 satellites would be needed if equipped with lasers of a power well beyond the state of the art, and with mirrors and optical systems of similar extremely high technologies, capable of 0.5 seconds retarget time. X-ray lasers, even if they could be developed, would be of doubtful effectiveness, and particle beams would probably be useless against ICBMs in boost phase.

If the defensive weapons were to be deployed in space, they would be exposed to many possible countermeasures by the potential enemy. If they were to be popped-up at the time of need, they would probably not reach the required altitude in time to be useful.

Moreover, what would happen if a layer failed catastrophically—if the anticipated attrition is not attained at all? If this occurred with the *last* layer, it is perfectly clear that the arrival of an average of 10 RVs (which *should* have been reduced to zero or one by the nominal performance of the previous layer) would result in ten RVs arriving at

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

their targets. But if the *first* (BPI) layer failed, the situation would be much worse. If one is designing on the basis of the expected performance of each system, layers two, three, and four will be sized to do their job against (respectively) 150 post-boost vehicles carrying an average of (say) 5 RVs; 75 RVs and their associated decoys; and, in the terminal area, 8 to 10 RVs left over by the expected operation of the mid-course system. Should the post-boost system fail, the mid-course system would not have the firepower to achieve a continuing 90 percent attrition from the ten-fold increase in surviving warheads and decoys. And if the post-boost system has not been sized to handle total failure of the BPI, it will not work either, and the terminal defenses will have to handle 10,000 RVs instead of ten.

Furthermore, post-boost and mid-course systems are absolutely dependent on birth-to-death tracking, and *that* in turn depends on space assets that can be mined, deceived, destroyed by ASATs, and the like.

If, on the other hand, one is looking towards a BMD system that might exact a modest attrition (say 50 percent—a number that has been used by Dr. Fred Hoffman in his advocacy of the utility of a modest BMD system), then it makes no sense to provide a layered defense. In that case, one should choose the candidate layer in which the defense has the greatest (if any) advantage over the offense or in which attrition can be exacted at minimum cost, and concentrate one's modest defense efforts in that layer. For defense of ICBM silos, this would clearly be an endoatmospheric terminal defense, but for the defense of cities, soft military facilities, unique hard targets, and the like, 50 percent effectiveness does not seem useful.

Finally, the natural reaction of the Soviet Union to the U.S. development of a BMD system would likely be a further increase in its offensive capability, this being an easy way to overcome any ballistic missile defense we might put up. We therefore believe that a BMD system would intensify, rather than mitigate, the arms race, and that it would make the United States less, rather than more, secure.

ENDNOTES

[1]The radius of a GEO is 42,000 kilometers, as can easily be calculated from the gravitational attraction of the earth. We are concerned with the distance from the laser in GEO to the Soviet ICBM field, which is at a latitude of about 57°. This

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

distance, by simple geometry, would be 39,300 kilometers. In attacking a booster at 55° north latitude, the beam from such a GEO satellite would enter the earth's atmosphere at an angle of about 27° with the horizontal.

[2]Hans A. Bethe, Richard L. Garwin, Kurt Gottfried, Henry W. Kendall, "Space-based Ballistic Missile Defense," *Scientific American*, Oct. 1984, p. 46.

[3]C. T. Cunningham, "Critique of Systems Analysis in the OTA Study 'Directed Energy Missile Defense in Space'," DDV-84-0007, Lawrence Livermore National Laboratory, (Aug. 30, 1984).

[4]Richard L. Garwin, "How Many Orbiting Lasers for Boost-phase Intercept?" *Nature*, May 23, 1985, p. 286.

[5]Robert Jastrow, typescript for presentation to the House Republican Study Committee, Aug. 9, 1984.

[6]A more powerful approach is to use a LEO auxiliary mirror to receive the excimer laser beam reflected from the GEO satellite, and *direct* (and focus) it on the booster. A 5-m diameter mirror at 3000 km range from its target could focus 0.3 μm light to a circle 0.23 m diam, but if that same mirror were used for pointing with respect to the varying infrared image, its resolution would be 2 meters. Accordingly, we have taken a 1 m diam spot as the attainable average.

[7]E. Walbridge, in "Angle Constraint for Nuclear-pumped X-ray Laser Weapons," *Nature*, July 19, 1984, and previous authors have noted that the super-radiant beam has a contribution to angular half-width by diffraction $\alpha_d = 1.22\lambda/D$, and by geometry (from skew rays in the wire) $\alpha_g = D/L$, with λ the X-ray wavelength (about 1.2 nm for 1-keV x ray), D wire diameter, and L the wire length. For L =2 m, the total angular beam spread is minimum at $\alpha = 1.5(\lambda/L)^{1/2}$, or about 40 microradians, at a wire diameter $D = (1.22\lambda L)^{1/2}$, or some 55 μm.

[8]Schemes for focusing X-ray lasers or obtaining greater coherence and smaller beams may be suitable for anti-satellite use, but remain to be explored.

[9]The beam spread from the original ion source or from the acceleration process itself can be reduced by a magnetic-lens telescope ("conservation of phase space" requires that the diameter be increased by the same factor that the beam divergence is reduced).

[10]A "rad" is the radiation unit commonly used to describe biological effects, namely an energy depositon of 100 erg per gram.

[11]Private communication from Sven Roosild, Nov. 19, 1984.

[12]Richard L. Garwin and Hans A. Bethe, "Anti-Ballistic-Missile Systems," *Scientific American*, March 1968, pp. 21–31.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

From the Address to the Nation by President Ronald Reagan March 23, 1983 "Peace and National Security"

THE SUBJECT I WANT TO DISCUSS WITH YOU, peace and national security, is both timely and important. Timely, because I've reached a decision which offers a new hope for our children in the 21st century. . . .[1]

. . . . Thus far tonight I've shared with you my thoughts on the problems of national security we must face together. My predecessors in the Oval Office have appeared before you on other occasions to describe the threat posed by Soviet power and have proposed steps to address that threat. But since the advent of nuclear weapons, those steps have been increasingly directed toward deterrence of aggression through the promise of retaliation.

This approach to stability through offensive threat has worked. We and our allies have succeeded in preventing nuclear war for more than three decades. In recent months, however, my advisers, including in particular the Joint Chiefs of Staff, have underscored the necessity to break out of a future that relies solely on offensive retaliation for our security.

Over the course of these discussions, I've become more and more deeply convinced that the human spirit must be capable of rising above dealing with other nations and human beings by threatening their existence. Feeling this way, I believe we must thoroughly

U.S. Department of State, *Department of State Bulletin,* vol. 83, no. 2073 (Washington, D.C.: USGPO, 1983), p. 8; pp. 13–14.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

examine every opportunity for reducing tensions and for introducing greater stability into the strategic calculus on both sides.

One of the most important contributions we can make is, of course, to lower the level of all arms, and particularly nuclear arms. We're engaged right now in several negotiations with the Soviet Union to bring about a mutual reduction of weapons. I will report to you a week from tomorrow my thoughts on that score. But let me just say, I'm totally committed to this course.

If the Soviet Union will join with us in our effort to achieve major arms reduction, we will have succeeded in stabilizing the nuclear balance. Nevertheless, it will still be necessary to rely on the specter of retaliation, on mutual threat. And that's a sad commentary on the human condition. Wouldn't it be better to save lives than to avenge them? Are we not capable of demonstrating our peaceful intentions by applying all our abilities and our ingenuity to achieving a truly lasting stability? I think we are. Indeed, we must.

After careful consultation with my advisers, including the Joint Chiefs of Staff, I believe there is a way. Let me share with you a vision of the future which offers hope. It is that we embark on a program to counter the awesome Soviet missile threat with measures that are defensive. Let us turn to the very strengths in technology that spawned our great industrial base and that have given us the quality of life we enjoy today.

What if free people could live secure in the knowledge that their security did not rest upon the threat of instant U.S. retaliation to deter a Soviet attack, that we could intercept and destroy strategic ballistic missiles before they reached our own soil or that of our allies?

I know this is a formidable, technical task, one that may not be accomplished before the end of this century. Yet, current technology has attained a level of sophistication where it's reasonable for us to begin this effort. It will take years, probably decades of effort on many fronts. There will be failures and setbacks, just as there will be successes and breakthroughs. And as we proceed, we must remain constant in preserving the nuclear deterrent and maintaining a solid capability for flexible response. But isn't it worth every investment necessary to free the world from the threat of nuclear war? We know it is.

In the meantime, we will continue to pursue real reductions in nuclear arms, negotiating from a position of strength that can be

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ensured only by modernizing our strategic forces. At the same time, we must take steps to reduce the risk of a conventional military conflict escalating to nuclear war by improving our non-nuclear capabilities.

America does possess—now—the technologies to attain very significant improvements in the effectiveness of our conventional, non-nuclear forces. Proceeding boldly with these new technologies, we can significantly reduce any incentive that the Soviet Union may have to threaten attack against the United States or its allies.

As we pursue our goal of defensive technologies, we recognize that our allies rely upon our strategic offensive power to deter attacks against them. Their vital interests and ours are inextricably linked. Their safety and ours are one. And no change in technology can or will alter that reality. We must and shall continue to honor our commitments.

I clearly recognize that defensive systems have limitations and raise certain problems and ambiguities. If paired with offensive systems, they can be viewed as fostering an aggressive policy, and no one wants that. But with these considerations firmly in mind, I call upon the scientific community in our country, those who gave us nuclear weapons, to turn their great talents now to the cause of mankind and world peace, to give us the means of rendering these nuclear weapons impotent and obsolete.

Tonight, consistent with our obligations of the ABM treaty and recognizing the need for closer consultation with our allies, I'm taking an important first step. I am directing a comprehensive and intensive effort to define a long-term research and development program to begin to achieve our ultimate goal of eliminating the threat posed by strategic nuclear missiles. This could pave the way for arms control measures to eliminate the weapons themselves. We seek neither military superiority nor political advantage. Our only purpose—one all people share—is to search for ways to reduce the danger of nuclear war.

My fellow Americans, tonight we're launchng an effort which holds the promise of changing the course of human history. There will be risks, and results take time. But I believe we can do it. As we cross this threshold, I ask for your prayers and your support.

Thank you, good night, and God bless you.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

From the Report of Secretary of Defense Caspar W. Weinberger to the Congress, February 4, 1985, on the FY 1986 Budget, FY 1987 Authorization Request, and FY 1986–90 Defense Program

THE STRATEGIC DEFENSE INITIATIVE

PRESIDENT REAGAN'S HISTORIC SPEECH on March 23, 1983, challenged the notion that we must always remain hostage to enemy ballistic missiles. Much has happened since then. The FY 1985 DOD budget, submitted to the Congress a year ago, contained a research program restructured on the basis of technology and policy analyses conducted in 1983. This new program focused our efforts on powerful new technologies that may provide options for an effective defense against ballistic missiles. In early 1984, I created a new organization within DOD, the Strategic Defense Initiative Organization (SDIO), directly responsible to me. Under able leadership and with the assistance of the Joint Staff, Service staffs, and various elements of OSD, the SDIO is directing research into the vast array of technologies applicable to the new weapons, sensors, and data-processing capabilities required for a task of this magnitude.

As a broad research program, the SDI is not based on any preconceived notions of what an effective defense system would or should look like. A number of different concepts, based on a range of promising technologies, are being examined, but no single concept or technology has yet been identified as the best or most appropriate one.

U.S. Department of Defense, *Report of the Secretary of the Defense Caspar W. Weinberger to the Congress* (Washington, D.C.: USGPO, 1985), pp. 54–57.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Effective defenses against ballistic missiles can significantly enhance deterrence. Such defenses could increase an aggressor's uncertainties regarding the ability of his weapons to penetrate them and destroy their intended targets. If the Soviet leaders were ever to contemplate initiating a nuclear attack, their purpose would be to destroy U.S. and NATO military forces that would be able to oppose their aggression. Yet, it would be very difficult for Soviet military planners to predict the likely outcome of a nuclear attack in the face of strategic defensive systems. Defenses that could deny to Soviet missiles the objectives of an attack, or deny to the Soviets confidence in the achievement of those objectives, would discourage them from even considering such an attack, and thus be a highly effective deterrent.

Based on our research so far, we cannot now say how soon we will be in a position to make decisions on defensive options; nor can we today describe all the forms such defenses could take. Clearly, Soviet military planners and scientists are confident that strategic missile defenses will be effective. Their extensive effort to acquire such defenses provides ample evidence of their conviction, as does their major effort to stop us from proceeding with our own defense initiative.

We all recognized from the outset that a complete system, or combination of systems, of strategic defenses could not be deployed overnight. There could well be a transitional period when some defenses would be deployed and operating before others might be ready.

Some have argued that such a transition would be particularly dangerous; that it would upset the present deterrent system without putting an adequate substitute in its place. The opposite is the case. If properly planned and phased, the capabilities deployed first would strengthen our existing deterrent. In fact, the initial capabilities could make a major contribution to the prevention of nuclear war before a fully effective system is deployed, because they would create many of the same uncertainties for Soviet planners that a fully deployed system would engender.

Thus, based on a realistic view of Soviet military planning, the transition to strategic defense would not be destabilizing. On the contrary, initial defense capabilities would offer a combination of benefits. They would contribute to deterrence by denying Soviet

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

attack goals. Should deterrence ever fail, they would save lives by reducing the scope of destruction resulting from a deliberate Soviet attack. And, in the case of an accidental Soviet launch, defenses would be the only hope for protecting our people. The more effective the defense, the more effective this protection would be.

Nevertheless, we would not want to let our efforts toward a transitional defense exhaust our energies or dilute our efforts to secure a thoroughly reliable, layered defense that would destroy incoming Soviet missiles at all phases of their flight. Such a system would destroy weapons, not people. It would not raise the question of whether we were trying to defend missiles or cities. We would be attempting to destroy Soviet missiles by non-nuclear means before Soviet missiles could approach any targets in the United States or the territory of our allies. The choice, therefore, is not one of defending people or weapons.

A. *The Strategic Defense Initiative and the Defense of Allies*

Because the security of the United States is inextricably linked to the security of our friends and allies, the SDI program will not confine itself solely to an exploration of technologies with a defensive potential against ICBMs and SLBMs. We will also examine, and at the same time work to achieve, technologies that will be effective against shorter range ballistic missiles. Indeed, there is reason to believe it will be at least as easy to destroy lesser range missiles as to destroy ICBMs. Throughout 1984, we held extensive discussions with our allies on the SDI effort. Given its potential contribution to collective security, SDI will be a major topic of mutual interest, and therefore will continue to be discussed with our friends and allies over the months and years ahead.

An effective defense against shorter range ballistic missiles could have a significant impact on deterring Soviet aggression in Europe. Soviet doctrine stresses the use of conventionally armed ballistic missiles to initiate rapid and wide-ranging attacks on crucial NATO military assets throughout Europe. The purpose of this tactic is to reduce NATO's ability to resist effectively the initial thrust of a Soviet conventional attack and to impede NATO's ability to resupply and reinforce its forces from outside Europe. By reducing or eliminating the military effectiveness of such ballistic missiles, defensive systems

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

have the potential for enhancing deterrence not only of nuclear war, but of conventional war as well.

Over the next several years, the United States will continue to work closely with its allies to enhance security. In the event that a decision to deploy defensive systems is made, consultation with our allies will play an important part.

B. *Hedge Against Soviet Defensive Technology Program*

Some critics of the President's Strategic Defense Initiative have the misconception that this increased emphasis on defensive systems is solely a U.S. initiative, which will alter the strategic balance. This is not the case. The Soviet Union has always considered defense to be an important and natural part of its national security policy. The extensive, advanced Soviet air defense network and the Soviets' large civil defense program are obvious examples of the priority they have attached to strategic defenses. In addition, the Soviets have for many years been working on a number of technologies, both traditional and advanced, with a potential for effectively defending against ballistic missiles. The Soviet Union currently is upgrading the capability of its Moscow ABM defense system—the world's only operational ABM system. The Soviets also are engaged in research and development (R&D) on a rapidly deployable ABM system that raises concerns about their potential ability to abrogate the ABM treaty and deploy a nationwide ABM defense system within the next ten years should they so choose.

In addition to these ABM efforts, the Soviet Union is deploying a new surface-to-air missile system, the SA-10, and is flight-testing another, the SA-X-12, both of which we believe can intercept some types of ballistic missiles. These air defenses and their radars are of concern because of their potential to provide the Soviet Union and its Warsaw Pact allies some degree of ABM protection—all within the bounds prescribed by the ABM treaty.

Since the late 1960s, the Soviet Union also has been pursuing a substantial advanced defensive technologies program—a program that has been exploring many of the same technologies of interest to the United States in the SDI program. In addition to covering a wide range of advanced technologies, including various laser and neutral particle beams, the Soviet program is much larger than the U.S. effort in terms of the amount of resources invested—plant, capital, and

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

manpower. These efforts could lead to the testing of space-based ABM systems in the mid-1990s and to their deployment after the turn of the century. The President's initiative, therefore, is being pursued in part as a prudent response to Soviet R&D activities in this field and as insurance against unilateral Soviet efforts to develop and deploy an advanced defensive system. A unilateral Soviet deployment of such advanced technologies, in concert with the Soviet Union's massive offensive forces and its already impressive air and passive defense capabilities, would make this a far more dangerous world than it is now.

These Soviet programs amply demonstrate that the Soviet Union does not feel restrained by the ABM treaty's prohibition against a widespread defense against ballistic missiles. Consistent with the importance Soviet doctrine places on defense, if the Soviets were to develop such a system as a result of their intensive research program, in all probability they would deploy it.

In the near term, the SDI provides a powerful deterrent to a potential Soviet breakout from the ABM treaty, a prospect made more worrisome by recent compliance questions—such as the construction of a new Soviet radar, which almost certainly is in violation of the ABM treaty. The SDI research program also makes clear that the United States takes seriously the Soviet buildup in offensive arms.

In the long term, SDI may provide the means by which both the United States and the Soviet Union can safely agree to very deep reductions and, someday, even the elimination of nuclear arms. We have sought to engage the Soviet Union in comprehensive discussions on how to make arms reductions more effective in the near term and on how to provide a safer future for all mankind.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems

Signed at Moscow May 26, 1972
Ratification advised by U.S. Senate August 3, 1972
Ratified by U.S. President September 30, 1972
Proclaimed by U.S. President October 3, 1972
Instruments of ratification exchanged October 3, 1972
Entered into force October 3, 1972

THE UNITED STATES OF AMERICA and the Union of Soviet Socialist Republics, hereinafter referred to as the Parties,

Proceeding from the premise that nuclear war would have devastating consequences for all mankind,

Considering that effective measures to limit anti-ballistic missile systems would be a substantial factor in curbing the race in strategic offensive arms and would lead to a decrease in the risk of outbreak of war involving nuclear weapons,

Proceeding from the premise that the limitation of anti-ballistic missile systems, as well as certain agreed measures with respect to the limitation of strategic offensive arms, would contribute to the creation of more favorable conditions for further negotiations on limiting strategic arms,

---

U.S. Arms Control and Disarmament Agency, *Arms Control and Disarmament Agreements: Texts and Histories of Negotiations* (Washington D.C.: USGPO, 1980), pp. 139–147; pp. 161–163.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Mindful of their obligations under Article VI of the Treaty on the Non-Proliferation of Nuclear Weapons,

Declaring their intention to achieve at the earliest possible date the cessation of the nuclear arms race and to take effective measures toward reductions in strategic arms, nuclear disarmament, and general and complete disarmament,

Desiring to contribute to the relaxation of international tension and the strengthening of trust between States,

Have agreed as follows:

Article I

1. Each Party undertakes to limit anti-ballistic missile (ABM) systems and to adopt other measures in accordance with the provisions of this Treaty.

2. Each Party undertakes not to deploy ABM systems for a defense of the territory of its country and not to provide a base for such a defense, and not to deploy ABM systems for defense of an individual region except as provided for in Article III of this Treaty.

Article II

1. For the purpose of this Treaty an ABM system is a system to counter strategic ballistic missiles or their elements in flight trajectory, currently consisting of:

(a) ABM interceptor missiles, which are interceptor missiles constructed and deployed for an ABM role, or of a type tested in an ABM mode;

(b) ABM launchers, which are launchers constructed and deployed for launching ABM interceptor missiles; and

(c) ABM radars, which are radars constructed and deployed for an ABM role, or of a type tested in an ABM mode.

2. The ABM system components listed in paragraph 1 of this Article include those which are:

(a) operational;
(b) under construction;
(c) undergoing testing;
(d) undergoing overhaul, repair or conversion; or
(e) mothballed.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Article III

Each Party undertakes not to deploy ABM systems or their components except that:

(a) within one ABM system deployment area having a radius of one hundred and fifty kilometers and centered on the Party's national capital, a Party may deploy: (1) no more than one hundred ABM launchers and no more than one hundred ABM interceptor missiles at launch sites, and (2) ABM radars within no more than six ABM radar complexes, the area of each complex being circular and having a diameter of no more than three kilometers; and

(b) within one ABM system deployment area having a radius of one hundred and fifty kilometers and containing ICBM silo launchers, a Party may deploy: (1) no more than one hundred ABM launchers and no more than one hundred ABM interceptor missiles at launch sites, (2) two large phased-array ABM radars comparable in potential to corresponding ABM radars operational or under construction on the date of signature of the Treaty in an ABM system deployment area containing ICBM silo launchers, and (3) no more than eighteen ABM radars each having a potential less than the potential of the smaller of the above-mentioned two large phased-array ABM radars.

Article IV

The limitations provided for in Article III shall not apply to ABM systems or their components used for development or testing, and located within current or additionally agreed test ranges. Each Party may have no more than a total of fifteen ABM launchers at test ranges.

Article V

1. Each Party undertakes not to develop, test, or deploy ABM systems or components which are sea-based, air-based, space-based, or mobile land-based.

2. Each Party undertakes not to develop, test, or deploy ABM launchers for launching more than one ABM interceptor missile at a time from each launcher, not to modify deployed launchers to provide them with such a capability, not to develop, test, or deploy automatic or semi-automatic or other similar systems for rapid reload of ABM launchers.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Article VI

To enhance assurance of the effectiveness of the limitations on ABM systems and their components provided by the Treaty, each Party undertakes:

(a) not to give missiles, launchers, or radars, other than ABM interceptor missiles, ABM launchers, or ABM radars, capabilities to counter strategic ballistic missiles or their elements in flight trajectory, and not to test them in an ABM mode; and

(b) not to deploy in the future radars for early warning of strategic ballistic missile attack except at locations along the periphery of its national territory and oriented outward.

Article VII

Subject to the provisions of this Treaty, modernization and replacement of ABM systems or their components may be carried out.

Article VIII

ABM systems or their components in excess of the numbers or outside the areas specified in this Treaty, as well as ABM systems or their components prohibited by this Treaty, shall be destroyed or dismantled under agreed procedures within the shortest possible agreed period of time.

Article IX

To assure the viability and effectiveness of this Treaty, each Party undertakes not to transfer to other States, and not to deploy outside its national territory, ABM systems or their components limited by this Treaty.

Article X

Each Party undertakes not to assume any international obligations which would conflict with this Treaty.

Article XI

The Parties undertake to continue active negotiations for limitations on strategic offensive arms.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Article XII

1. For the purpose of providing assurance of compliance with the provisions of this Treaty, each Party shall use national technical means of verification at its disposal in a manner consistent with generally recognized principles of international law.

2. Each Party undertakes not to interfere with the national technical means of verification of the other Party operating in accordance with paragraph 1 of this Article.

3. Each Party undertakes not to use deliberate concealment measures which impede verification by national technical means of compliance with the provisions of this Treaty. This obligation shall not require changes in current construction, assembly, conversion, or overhaul practices.

Article XIII

1. To promote the objectives and implementation of the provisions of this Treaty, the Parties shall establish promptly a Standing Consultative Commission, within the framework of which they will:

(a) consider questions concerning compliance with the obligations assumed and related situations which may be considered ambiguous;

(b) provide on a voluntary basis such information as either Party considers necessary to assure confidence in compliance with the obligations assumed;

(c) consider questions involving unintended interference with national technical means of verification;

(d) consider possible changes in the strategic situation which have a bearing on the provisions of this Treaty;

(e) agree upon procedures and dates for destruction or dismantling of ABM systems or their components in cases provided for by the provisions of this Treaty;

(f) consider, as appropriate, possible proposals for further increasing the viability of this Treaty; including proposals for amendments in accordance with the provisions of this Treaty;

(g) consider, as appropriate, proposals for further measures aimed at limiting strategic arms.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

2. The Parties through consultation shall establish, and may amend as appropriate, Regulations for the Standing Consultative Commission governing procedures, composition and other relevant matters.

Article XIV

1. Each Party may propose amendments to this Treaty. Agreed amendments shall enter into force in accordance with the procedures governing the entry into force of this Treaty.

2. Five years after entry into force of this Treaty, and at five-year intervals thereafter, the Parties shall together conduct a review of this Treaty.

Article XV

1. This Treaty shall be of unlimited duration.

2. Each Party shall, in exercising its national sovereignty, have the right to withdraw from this Treaty if it decides that extraordinary events related to the subject matter of this Treaty have jeopardized its supreme interests. It shall give notice of its decision to the other Party six months prior to withdrawal from the Treaty. Such notice shall include a statement of the extraordinary events the notifying Party regards as having jeopardized its supreme interests.

Article XVI

1. This Treaty shall be subject to ratification in accordance with the constitutional procedures of each Party. The Treaty shall enter into force on the day of the exchange of instruments of ratification.

2. This Treaty shall be registered pursuant to Article 102 of the Charter of the United Nations.

DONE at Moscow on May 26, 1972, in two copies, each in the English and Russian languages, both texts being equally authentic.

FOR THE UNITED STATES OF AMERICA

President of the United States of America

FOR THE UNION OF SOVIET SOCIALIST REPUBLICS

General Secretary of the Central Committee of the CPSU

* * *

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Agreed Statements, Common Understandings, and Unilateral Statements Regarding the Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missiles

1. Agreed Statements

The document set forth below was agreed upon and initialed by the Heads of the Delegations on May 26, 1972 (letter designations added);

AGREED STATEMENTS REGARDING THE TREATY BETWEEN THE UNITED STATES OF AMERICA AND THE UNION OF SOVIET SOCIALIST REPUBLICS ON THE LIMITATION OF ANTI-BALLISTIC MISSILE SYSTEMS

[A]

The Parties understand that, in addition to the ABM radars which may be deployed in accordance with subparagraph (a) of Article III of the Treaty, those non-phased-array ABM radars operational on the date of signature of the Treaty within the ABM system deployment area for defense of the national capital may be retained.

[B]

The Parties understand that the potential (the product of mean emitted power in watts and antenna area in square meters) of the smaller of the two large phased-array ABM radars referred to in subparagraph (b) of Article III of the Treaty is considered for purposes of the Treaty to be three million.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

[C]

The Parties understand that the center of the ABM system deployment area centered on the national capital and the center of the ABM system deployment area containing ICBM silo launchers for each Party shall be separated by no less than thirteen hundred kilometers.

[D]

In order to insure fulfillment of the obligation not to deploy ABM systems and their components except as provided in Article III of the Treaty, the Parties agree that in the event ABM systems based on other physical principles and including components capable of substituting for ABM interceptor missiles, ABM launchers, or ABM radars are created in the future, specific limitations on such systems and their components would be subject to discussion in accordance with Article XIII and agreement in accordance with Article XIV of the Treaty.

[E]

The Parties understand that Article V of the Treaty includes obligations not to develop, test or deploy ABM interceptor missiles for the delivery by each ABM interceptor missile of more than one independently guided warhead.

[F]

The Parties agree not to deploy phased-array radars having a potential (the product of mean emitted power in watts and antenna area in square meters) exceeding three million, except as provided for in Articles III, IV, and VI of the Treaty, or except for the purposes of tracking objects in outer space or for use as national technical means of verification.

[G]

The parties understand that Article IX of the Treaty includes the obligation of the U.S. and the USSR not to provide to other States technical descriptions or blue prints specially worked out for the construction of ABM systems and their components limited by the Treaty.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

2. Common Understandings

Common understanding of the Parties on the following matters was reached during the negotiations:

A. *Location of ICBM Defenses*

The U.S. Delegation made the following statement on May 26, 1972:

Article III of the ABM Treaty provides for each side one ABM system deployment area centered on its national capital and one ABM system deployment area containing ICBM silo launchers. The two sides have registered agreement on the following statement: "The Parties understand that the center of the ABM system deployment area centered on the national capital and the center of the ABM system deployment area containing ICBM silo launchers for each Party shall be separated by no less than thirteen hundred kilometers." In this connection, the U.S. side notes that its ABM system deployment area for defense of ICBM silo launchers, located west of the Mississippi River, will be centered in the Grand Forks ICBM silo launcher deployment area. (See Agreed Statement [C].)

B. *ABM Test Ranges*

The U.S. Delegation made the following statement on April 26, 1972:

Article IV of the ABM Treaty provides that "the limitations provided for in Article III shall not apply to ABM systems or their components used for development or testing, and located within current or additionally agreed test ranges." We believe it would be useful to assure that there is no misunderstanding as to current ABM test ranges. It is our understanding that ABM test ranges encompass the area within which ABM components are located for test purposes. The current U.S. ABM test ranges are at White Sands, New Mexico, and at Kwajalein Atoll, and the current Soviet ABM test range is near Sary Shagan in Kazakhstan. We consider that non-phased array radars of types used for range safety or instrumentation purposes may be located outside of ABM test ranges. We interpret the reference in Article IV to "additionally agreed test ranges" to mean that ABM components will not be located at any other test ranges without prior agreement between our Governments that there will be such additional ABM test ranges.

On May 5, 1972, the Soviet Delegation stated that there was a common understanding on what ABM test ranges were, that the use of the types of non-ABM radars for range safety or instrumentation was not limited under the Treaty, that the reference in Article IV to "additionally agreed" test

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ranges was sufficiently clear, and that national means permitted identifying current test ranges.

C. *Mobile ABM Systems*

On January 29, 1972, the U.S. Delegation made the following statement:

Article V(1) of the Joint Draft Text of the ABM Treaty includes an undertaking not to develop, test, or deploy mobile land-based ABM systems and their components. On May 5, 1971, the U.S. side indicated that, in its view, a prohibition on deployment of mobile ABM systems and components would rule out the deployment of ABM launchers and radars which were not permanent fixed types. At that time, we asked for the Soviet view of this interpretation. Does the Soviet side agree with the U.S. side's interpretation put forward on May 5, 1971?

On April 13, 1972, the Soviet Delegation said there is a general common understanding on this matter.

D. *Standing Consultative Commission*

Ambassador Smith made the following statement on May 22, 1972:

The United States proposes that the sides agree that, with regard to initial implementation of the ABM Treaty's Article XIII on the Standing Consultative Commission (SCC) and of the consultation Articles to the Interim Agreement on offensive arms and the Accidents Agreement,* agreement establishing the SCC will be worked out early in the follow-on SALT negotiations; until that is completed, the following arrangements will prevail: when SALT is in session, any consultation desired by either side under these Articles can be carried out by the two SALT Delegations; when SALT is not in session, *ad hoc* arrangements for any desired consultations under these Articles may be made through diplomatic channels.

Minister Semenov replied that, on an *ad referendum* basis, he could agree that the U.S. statement corresponded to the Soviet understanding.

E. *Standstill*

On May 6, 1972, Minister Semenov made the following statement:

In an effort to accommodate the wishes of the U.S. side, the Soviet Delegation is prepared to proceed on the basis that the two sides will in fact

*See Article 7 of Agreement to Reduce the Risk of Outbreak of Nuclear War Between the United States of America and the Union of Soviet Socialist Republics, signed Sept. 30, 1971.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

observe the obligations of both the Interim Agreement and the ABM Treaty beginning from the date of signature of these two documents.

In reply, the U.S. Delegation made the following statement on May 20, 1972:

The U.S. agrees in principle with the Soviet statement made on May 6 concerning observance of obligations beginning from date of signature but we would like to make clear our understanding that this means that, pending ratification and acceptance, neither side would take any action prohibited by the agreements after they had entered into force. This understanding would continue to apply in the absence of notification by either signatory of its intention not to proceed with ratification or approval.

The Soviet Delegation indicated agreement with the U.S. statement.

3. Unilateral Statements

The following noteworthy unilateral statements were made during the negotiations by the United States Delegation:

A. *Withdrawal from the ABM Treaty*

On May 9, 1972, Ambassador Smith made the following statement:

The U.S. Delegation has stressed the importance the U.S. Government attaches to achieving agreement on more complete limitations on strategic offensive arms, following agreement on an ABM Treaty and on an Interim Agreement on certain measures with respect to the limitation of strategic offensive arms. The U.S. Delegation believes that an objective of the follow-on negotiations should be to constrain and reduce on a long-term basis threats to the survivability of our respective strategic retaliatory forces. The USSR Delegation has also indicated that the objectives of SALT would remain unfulfilled without the achievement of an agreement providing for more complete limitations on strategic offensive arms. Both sides recognize that the initial agreements would be steps toward the achievement of more complete limitations on strategic arms. If an agreement providing for more complete strategic offensive arms limitations were not achieved within five years, U.S. supreme interests could be jeopardized. Should that occur, it would constitute a basis for withdrawal from the ABM Treaty. The U.S. does not wish to see such a situation occur, nor do we believe that the USSR does. It is because we wish to prevent such a situation that we emphasize the importance the U.S. Government attaches to achievement of more complete limitations on strategic offensive arms. The U.S. Executive will inform the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Congress, in connection with Congressional consideration of the ABM Treaty and the Interim Agreement, of this statement of the U.S. position.

B. *Tested in ABM Mode*

On April 7, 1972, the U.S. Delegation made the following statement:

Article II of the Joint Text Draft uses the term "tested in an ABM mode," in defining ABM components, and Article VI includes certain obligations concerning such testing. We believe that the sides should have a common understanding of this phrase. First, we would note that the testing provisions of the ABM Treaty are intended to apply to testing which occurs after the date of signature of the Treaty, and not to any testing which may have occurred in the past. Next, we would amplify the remarks we have made on this subject during the previous Helsinki phrase by setting forth the objectives which govern the U.S. view on the subject, namely, while prohibiting testing of non-ABM components for ABM purposes: not to prevent testing of ABM components, and not to prevent testing of non-ABM components for non-ABM purposes. To clarify our interpretation of "tested in an ABM mode," we note that we would consider a launcher, missile or radar to be "tested in an ABM mode" if, for example, any of the following events occur: (1) a launcher is used to launch an ABM interceptor missile, (2) an interceptor missile is flight tested against a target vehicle which has a flight trajectory with characteristics of a strategic ballistic missile flight trajectory, or is flight tested in conjunction with the test of an ABM interceptor missile or an ABM radar at the same test range, or is flight tested to an altitude inconsistent with interception of targets against which air defenses are deployed, (3) a radar makes measurements on a cooperative target vehicle of the kind referred to in item (2) above during the reentry portion of its trajectory or makes measurements in conjunction with the test of an ABM interceptor missile or an ABM radar at the same test range. Radars used for purposes such as range safety or instrumentation would be exempt from application of these criteria.

C. *No-Transfer Article of ABM Treaty*

On April 18, 1972, the U.S. Delegation made the following statement:

In regard to this Article [IX], I have a brief and I believe self-explanatory statement to make. The U.S. side wishes to make clear that the provisions of this Article do not set a precedent for whatever provision may be considered for a Treaty on Limiting Strategic Offensive Arms. The question of transfer of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

strategic offensive arms is a far more complex issue, which may require a different solution.

D. *No Increase in Defense of Early-Warning Radars*

On July 28, 1970, the U.S. Delegation made the following statement:

Since Hen House radars [Soviet ballistic missile early-warning radars] can detect and track ballistic missile warheads at great distances, they have a significant ABM potential. Accordingly, the U.S. would regard any increase in the defenses of such radars by surface-to-air missiles as inconsistent with an agreement.

* * *

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Protocol to the Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems

Signed at Moscow July 3, 1974
Ratification advised by U.S. Senate November 10, 1975
Ratified by U.S. President March 19, 1976
Instruments of ratification exchanged May 24, 1976
Proclaimed by U.S. President July 6, 1976
Entered into force May 24, 1976

THE UNITED STATES OF AMERICA and the Union of Soviet Socialist Republics, hereinafter referred to as the Parties,

Proceeding from the Basic Principles of Relations between the United States of America and the Union of Soviet Socialist Republics signed on May 29, 1972,

Desiring to further the objectives of the Treaty between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems signed on May 26, 1972, hereinafter referred to as the Treaty,

Reaffirming their conviction that the adoption of further measures for the limitation of strategic arms would contribute to strengthening international peace and security,

Proceeding from the premise that further limitation of anti-ballistic missile systems will create more favorable conditions for the completion of work on a permanent agreement on more complete measures for the limitation of strategic offensive arms,

Have agreed as follows:

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Article I

1. Each Party shall be limited at any one time to a single area out of the two provided in Article III of the Treaty for deployment of anti-ballistic missile (ABM) systems or their components and accordingly shall not exercise its right to deploy an ABM system or its components in the second of the two ABM system deployment areas permitted by Article III of the Treaty, except as an exchange of one permitted area for the other in accordance with Article II of this Protocol.

2. Accordingly, except as permitted by Article II of this Protocol: the United States of America shall not deploy an ABM system or its components in the area centered on its capital, as permitted by Article III(a) of the Treaty, and the Soviet Union shall not deploy an ABM system or its components in the deployment area of intercontinental ballistic missile (ICBM) silo launchers as permitted by Article III(b) of the Treaty.

Article II

1. Each Party shall have the right to dismantle or destroy its ABM system and the components thereof in the area where they are presently deployed and to deploy an ABM system or its components in the alternative area permitted by Article III of the Treaty, provided that prior to initiation of construction, notification is given in accord with the procedure agreed to in the Standing Consultative Commission, during the year beginning October 3, 1977 and ending October 2, 1978, or during any year which commences at five year intervals thereafter, those being the years for periodic review of the Treaty, as provided in Article XIV of the Treaty. This right may be exercised only once.

2. Accordingly, in the event of such notice, the United States would have the right to dismantle or destroy the ABM system and its components in the deployment area of ICBM silo launchers and to deploy an ABM system or its components in an area centered on its capital, as permitted by Article III(a) of the Treaty, and the Soviet Union would have the right to dismantle or destroy the ABM system and its components in the area centered on its capital and to deploy an ABM system or its components in an area con-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

taining ICBM silo launchers, as permitted by Article III(b) of the Treaty.

3. Dismantling or destruction and deployment of ABM systems or their components and the notification thereof shall be carried out in accordance with Article VIII of the ABM Treaty and procedures agreed to in the Standing Consultative Commission.

Article III

The rights and obligations established by the Treaty remain in force and shall be complied with by the Parties except to the extent modified by this Protocol. In particular, the deployment of an ABM system or its components within the area selected shall remain limited by the levels and other requirements established by the Treaty.

Article IV

This Protocol shall be subject to ratification in accordance with the constitutional procedures of each Party. It shall enter into force on the day of the exchange of instruments of ratification and shall thereafter be considered an integral part of the Treaty.

DONE at Moscow on July 3, 1974, in duplicate, in the English and Russian languages, both texts being equally authentic.

For the United States of America:
RICHARD NIXON
President of the United States of America

For the Union of Soviet Socialist Republics:
L.I. BREZHNEV
General Secretary of the Central Committee of the CPSU

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Notes on Contributors

Christoph Bertram, born in 1937 in Kiel, Germany, is the chief political editor for the German weekly *Die Zeit*. He was director of the International Institute for Strategic Studies in London from 1974 to 1982. His recent articles include "Political Implications of the Theater Nuclear Balance," in B. Blechman, ed., *Rethinking the U.S. Strategic Posture* (1982) and "Europe and America in 1983," in *Foreign Affairs* magazine (1984).

Hans A. Bethe, born in 1906 in Strasbourg, France, is Professor Emeritus of physics at Cornell University. A Nobel laureate in physics, Dr. Bethe was director of theoretical physics for the Manhattan Project during World War II. He has written widely on defense and technology issues and is a consultant to the Los Alamos and Lawrence Livermore Laboratories.

Jeffrey Boutwell, born in 1950 in Boston, Massachusetts, is a staff associate at the Committee for International Security Studies of the American Academy of Arts and Sciences, and adjunct research fellow at the Center for Science and International Affairs, Harvard University. He is the author of *Nuclear Weapons and the German Dilemma* (forthcoming from Cornell University Press) and co-editor of The *Nuclear Confrontation in Europe* (Croom Helm, 1985).

Abram Chayes, born in 1922 in Chicago, Illinois, is Felix Frankfurter Professor of Law, Harvard University. Professor Chayes served as legal advisor to the U.S. Department of State (1961–1964). Among his publications are *ABM: An Evaluation of the Decision to Deploy an Anti-Ballistic Missile System* (1969) and *International Arrangements for Nuclear Fuel Reprocessing* (1977).

Antonia Handler Chayes, born in 1929 in New York City, is a partner of the Boston law firm Csaplar & Bok and a fellow of Harvard University's Center for International Affairs. Dr. Chayes has also served as under secretary of the U.S. Air Force (1979–1981). Prior to that, she was dean of Jackson College and an associate professor of political science (1968–1970). The author of numerous articles, her most recent book is *The Corporate Legal Function* (1985).

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Marie-France Garaud, born in 1937 in Poitiers, France, is founder and president of the Institut International de Geopolitique. Former political advisor to Georges Pompidou during his prime ministership and presidency, and a candidate for the presidency in 1981, she now serves as Conseiller Résérendaire Cour des Comptes, the French equivalent of the U.S. General Counsel to the United States General Accounting Office.

Richard L. Garwin, born in 1928 in Cleveland, Ohio, is an IBM fellow at the Thomas J. Watson Research Center and holds teaching and research positions at Columbia, Cornell, and Harvard Universities. Dr. Garwin served on the president's Science Advisory Committee from 1962 to 1965 and 1969 to 1972. Formerly a member of the Defense Science Board (1966–1969), he has been an active consultant to the U.S. government and its agencies since the 1950s.

David Holloway, born in 1943 in Dublin, Ireland, is a senior research associate for international security and arms control at Stanford University, and a reader in politics at the University of Edinburgh. Recent publications include *The Soviet Union and The Arms Race* (1983) and *The Reagan Strategic Defense Initiative: A Technical, Political, and Arms Control Assessment* (1985), which he co-authored with Sidney D. Drell and Philip J. Farley.

F. A. Long, born in 1910 in Great Falls, Montana, is Professor Emeritus of Chemistry and of Science and Society at Cornell University's Program on Science, Technology, and Society. He was the assistant director for science and technology of the U.S. Arms Control and Disarmament Agency and participated in the 1963 negotiations in Moscow that resulted in the 1963 Limited Test Ban Treaty. He is co-editor of *Arms, Defense Policy, and Arms Control* (1975), *The Genesis of New Weapons: Decision Making for Military R&D* (1980), and *Appropriate Technology and Social Values: A Critical Appraisal* (1980).

T. B. Millar, born in 1925 in Western Australia, was director of the Australian Institute of International Affairs (1969–1976), and is currently a professorial fellow in international relations at the Australian National University. His recent publications include *Foreign Policy* (1972), *Australia in Peace and War* (1978), and *The East-West Strategic Balance* (1981).

George Rathjens, born in 1925 in Fairbanks, Alaska, is a professor of political science at the Massachusetts Institute of Technology. He has served as chief scientist and deputy director of the Defense Department's Advanced Research Projects Agency, as special assistant to the director of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the U.S. Arms Control and Disarmament Agency, and as director of the Institute for Defense Analyses' Systems Evaluation Division. He is the author of numerous articles and co-edited *Arms, Defense Policy, and Arms Control* (1975).

Jack Ruina, born in 1923 in Rypin, Poland, is professor of electrical engineering at the Massachusetts Institute of Technology. The former director of the Defense Department's Advanced Research Projects Agency, Dr. Ruina has written extensively on issues of defense technology.

Eliot Spitzer, born in 1959 in New York City, recently graduated from Harvard Law School. He is currently a law clerk to the Honorable Robert W. Sweet, federal district judge, southern district of New York.

John C. Toomay, born in 1922 in Ontario, California, is a retired Major General of the U.S. Air Force. A member of the U.S. Air Force Scientific Advisory Board, he has worked extensively in research and development for U.S. strategic systems. He was a member of the Defensive Technologies Study Team established to advise President Reagan on strategic defense initiatives and is the author of numerous articles on defense and strategic technology.

John Wilkinson, M.P., born in 1940 in Slough, England, is chairman of the Conservative Parliamentary Aviation Committee and vice-chairman of the Conservative Space and Defense Committees. He is co-author with Michael Chichester of *The Uncertain Ally—British Defense Policy 1960–1990* (1982).

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Issues of DÆDALUS in Print

These may be ordered at the current single issue price from the *Dædalus* Business Office, P.O. Box 515, Canton, Massachusetts 02021, U.S.A. (Tel) 617-828-8450. For bulk order prices, see order card this issue.

Weapons in Space, vol. I: Concepts and Technologies *(Spring 1985)*

Australia: Terra Incognita? *(Winter 1985)*

Values, Resources, and Politics in America's Schools *(Fall 1984)*

Anticipations *(Summer 1984)*

Nordic Voices *(Spring 1984)*

The Nordic Enigma *(Winter 1984)*

Human Rights *(Fall 1983)*

The Arts and Humanities in America's Schools *(Summer 1983)*

Scientific Literacy *(Spring 1983)*

Reading: Old and New *(Winter 1983)*

Print Culture and Video Culture *(Fall 1982)*

Representations and Realities *(Summer 1982)*

Religion *(Winter 1982)*

America's Schools: Portraits and Perspectives *(Fall 1981)*

America's Schools: Public and Private *(Summer 1981)*

U.S. Defense Policy in the 1980s, Volume II *(Winter 1981)*

U.S. Defense Policy in the 1980s, Volume I *(Fall 1980)*

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The End of Consensus? *(Summer 1980)*

Intellect and Imagination: The Limits and Presuppositions of Intellectual Inquiry *(Spring 1980)*

Modern Technology: Problem or Opportunity? *(Winter 1980)*

The State *(Fall 1979)*

Hypocrisy, Illusion, and Evasion *(Summer 1979)*

The European Predicament *(Spring 1979)*

Generations *(Fall 1978)*

Rousseau for Our Time *(Summer 1978)*

Limits of Scientific Inquiry *(Spring 1978)*

A New America? *(Winter 1978)*

Discoveries and Interpretations, Volume II *(Fall 1977)*

Discoveries and Interpretations, Volume I *(Summer 1977)*

Edward Gibbon and the Decline and Fall of the Roman Empire *(Summer 1976)*

Adulthood *(Spring 1976)*

In Praise of Books *(Winter 1976)*

Arms, Defense Policy, and Arms Control *(Summer 1975)*

Wisdom, Revelation, and Doubt: Perspectives on the First Millennium B.C. *(Spring 1975)*

American Higher Education: Toward an Uncertain Future Volume II *(Winter 1975)*

American Higher Education: Toward an Uncertain Future Volume I *(Fall 1974)*

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Science and Its Public: The Changing Relationship *(Summer 1974)*

Twentieth-Century Classics Revisited *(Winter 1974)*

The Search for Knowledge *(Spring 1973)*

Post-Traditional Societies *(Winter 1973)*

How Others See the United States *(Fall 1972)*

Intellectuals and Change *(Summer 1972)*

Intellectuals and Tradition *(Spring 1972)*

Myth, Symbol, and Culture *(Winter 1972)*

The Future of the Black Colleges *(Summer 1971)*

The Historian and the World of the Twentieth Century *(Spring 1971)*

Historical Studies Today *(Winter 1971)*

The Making of Modern Science: Biographical Studies *(Fall 1970)*

Rights and Responsibilities: The University's Dilemma *(Summer 1970)*

Theory in Humanistic Studies *(Spring 1970)*

The Embattled University *(Winter 1970)*

Dædalus Dialogues *(Fall 1969)*

The Future of the Humanities *(Summer 1969)*

Ethical Aspects of Experimentation with Human Subjects *(Spring 1969)*

Perspectives on Business *(Winter 1969)*

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Historical Population Studies *(Spring 1968)*

Students and Politics *(Winter 1968)*

America's Changing Environment *(Fall 1967)*

Color and Race *(Spring 1967)*

Religion in America *(Winter 1967)*

Fiction in Several Languages *(Fall 1966)*

Tradition and Change *(Summer 1966)*

Conditions of World Order *(Spring 1966)*

The Negro American—2 (special issue, *Winter 1966)*

The Negro American—1 (special issue, *Fall 1965)*

The Contemporary University: U.S.A. *(Fall 1964)*

Themes in Transition *(Summer 1963)*

Perspectives on the Novel *(Spring 1963)*

The American Reading Public *(Winter 1963)*

Current Work and Controversies—2 *(Summer 1962)*

Excellence and Leadership in a Democracy *(Fall 1961)*

Twenty Years of *Dædalus (Index 1958-1977)*

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Books Published from Issues of DÆDALUS

Many issues of *Dædalus* appear in expanded form, as hardcover books and in subsequent paperback editions. Those currently in print are listed below.

HARDCOVER EDITIONS

Reading in the 1980s, edited by Stephen R. Graubard. R.R. Bowker, 1983.

Religion and America: Spirituality in a Secular Age, edited by Mary Douglas and Steven M. Tipton. Beacon Press, 1983.

Generations, edited by Stephen R. Graubard. W.W. Norton and Company, Inc., 1979.

Intellectuals and Traditions, edited by S.N. Eisenstadt and Stephen R. Graubard. Humanities Press, 1973.

Twelve to Sixteen: Early Adolescence, edited by Jerome Kagan and Robert Coles. W.W. Norton and Company, Inc., 1972.

PAPERBACK EDITIONS

Australia: The Dædalus Symposium, edited by Stephen R. Graubard. Angus & Robertson (Australia and U.K.), *1985.*

Religion and America: Spirituality in a Secular Age, edited by Mary Douglas and Steven M. Tipton. Beacon Press, 1983.

The State, edited by Stephen R. Graubard. W.W. Norton and Company, Inc., 1980.

Generations, edited by Stephen R. Graubard. W.W. Norton and Company, Inc., 1979.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Adulthood, edited by Erik H. Erikson. W.W. Norton and Company, Inc., 1978.

The Family, edited by Alice S. Rossi, Jerome Kagan, and Tamara K. Hareven. W.W. Norton and Company, Inc., 1978.

Doing Better and Feeling Worse: Health in the United States, edited by John H. Knowles. W.W. Norton and Company, Inc., 1977.

Science and Its Public: The Changing Relationship, edited by Gerald Holton and William Blanpied. D. Reidel Publishing Company, 1976.

Arms, Defense Policy, and Arms Control, edited by Franklin A. Long and George W. Rathjens. W.W. Norton and Company, Inc., 1975.

Slavery, Colonialism, and Racism, edited by Sidney W. Mintz. W.W. Norton and Company, Inc., 1974.

The No-Growth Society, edited by Mancur Olson and Hans H. Landsberg. W.W. Norton and Company, Inc., 1973.

Language as a Human Problem, edited by Einar Haugen and Morton Bloomfield. W.W. Norton and Company, Inc., 1973.

Twelve to Sixteen: Early Adolescence, edited by Jerome Kagan and Robert Coles. W.W. Norton and Company, Inc., 1972.

Historical Studies Today, edited by Felix Gilbert and Stephen R. Graubard. W.W. Norton and Company, Inc., 1972.

The Embattled University, edited by Stephen R. Graubard and Geno A. Ballotti. George Braziller, Inc., 1970.

Philosophers and Kings: Studies in Leadership, edited by Dankwart A. Rustow. George Braziller, Inc., 1970.

Experimentation with Human Subjects, edited by Paul A. Freund. George Braziller, Inc., 1970.

The Conscience of the City, edited by Martin Meyerson. George Braziller, Inc., 1970.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED